FIG. 1

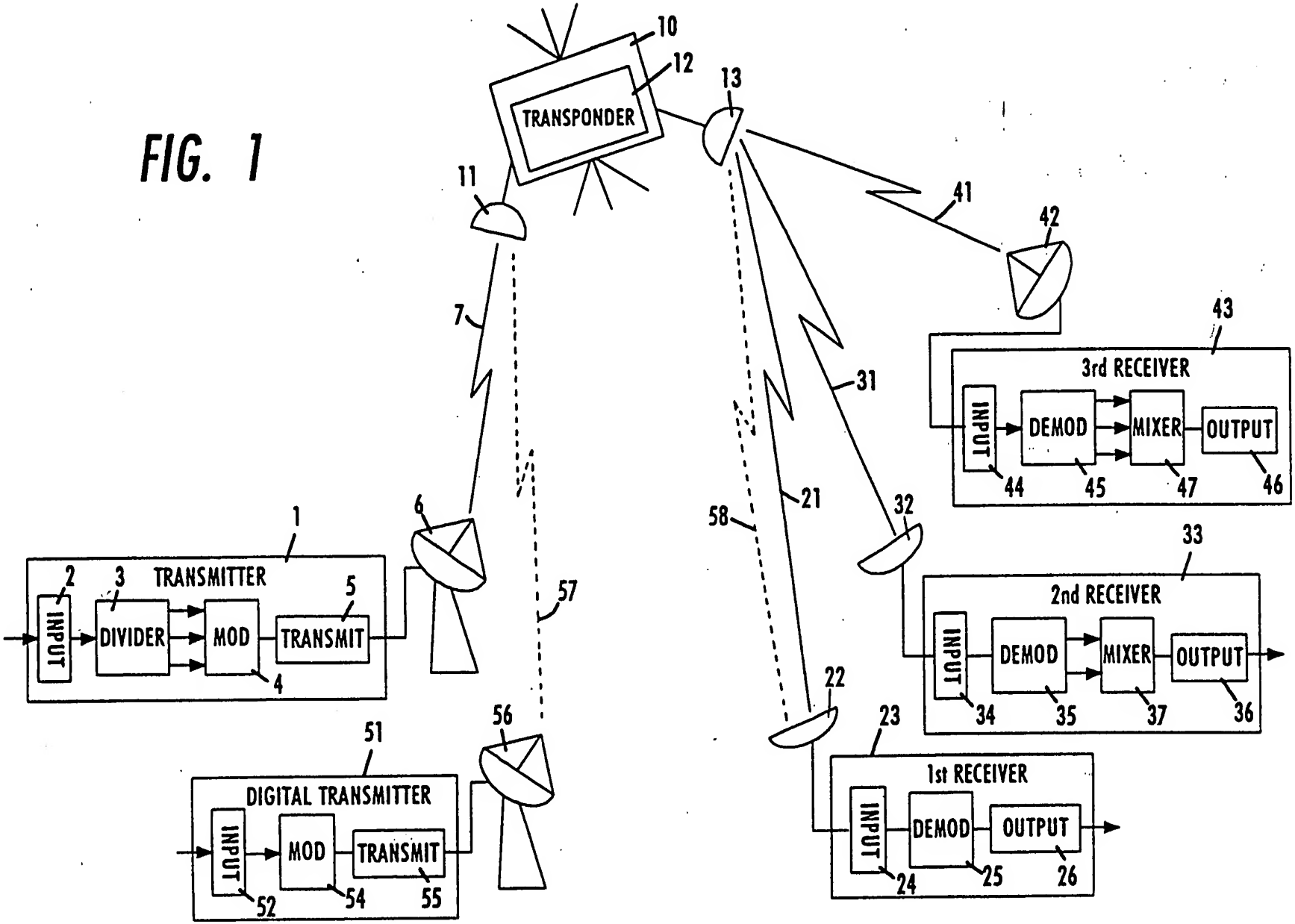

10
12
TRANSPONDER
13
11
41
42
7
43
3rd RECEIVER
INPUT
DEMOD
MIXER
OUTPUT
44
45
47
46
31
21
58
32
1
6
TRANSMITTER
2
3
5
INPUT
DIVIDER
MOD
TRANSMIT
4
57
33
2nd RECEIVER
INPUT
DEMOD
MIXER
OUTPUT
34
35
37
36
22
56
23
51
1st RECEIVER
DIGITAL TRANSMITTER
INPUT
DEMOD
OUTPUT
INPUT
MOD
TRANSMIT
24
25
26
52
54
55

FIG. 2

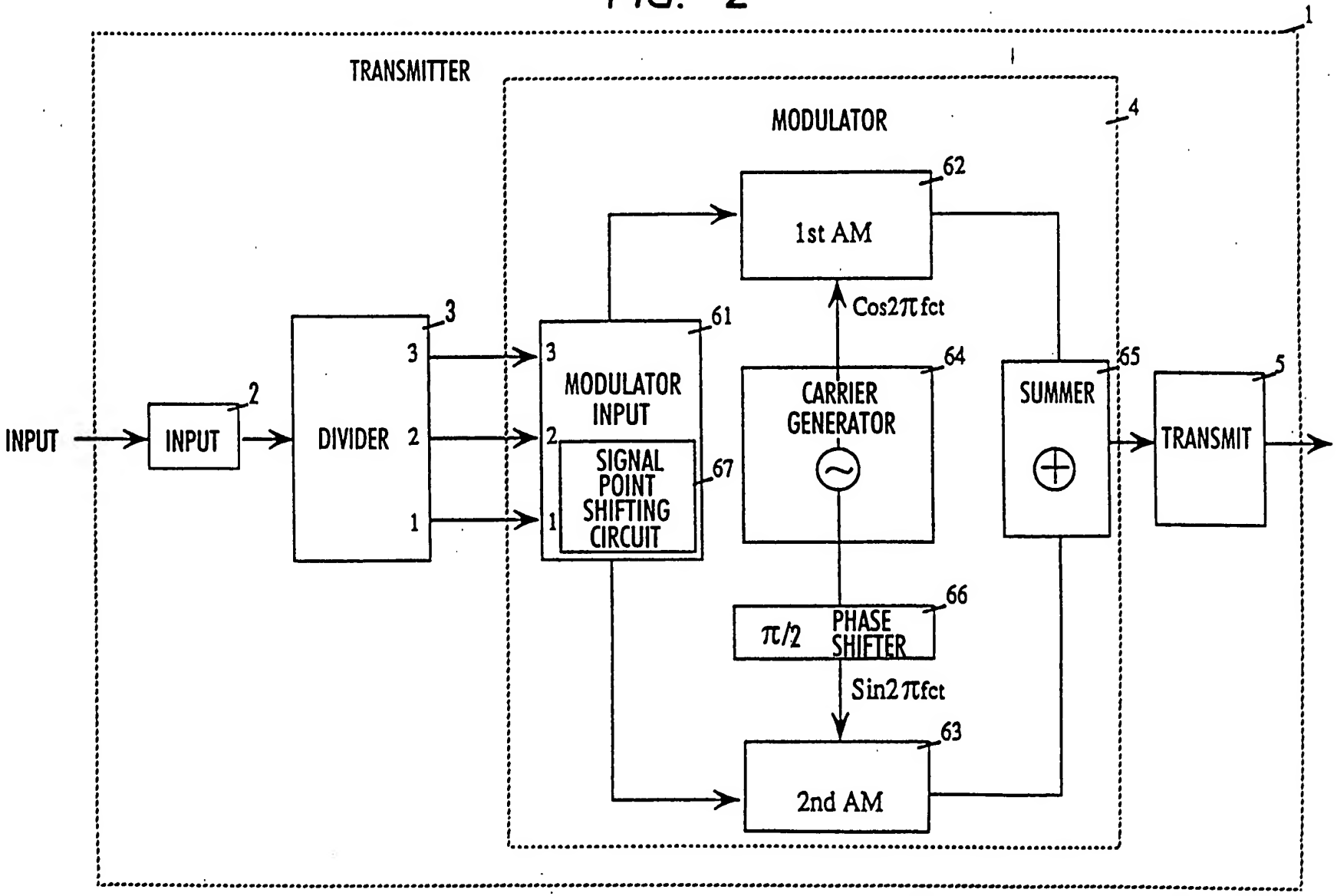

1
TRANSMITTER
MODULATOR
4
62
1st AM
Cos2πfct
64
CARRIER GENERATOR
65
SUMMER
5
TRANSMIT
INPUT
2
INPUT
3
DIVIDER
3
2
1
61
3
MODULATOR INPUT
2
1
SIGNAL POINT SHIFTING CIRCUIT
67
66
π/2
PHASE SHIFTER
Sin2πfct
63
2nd AM

FIG. 3

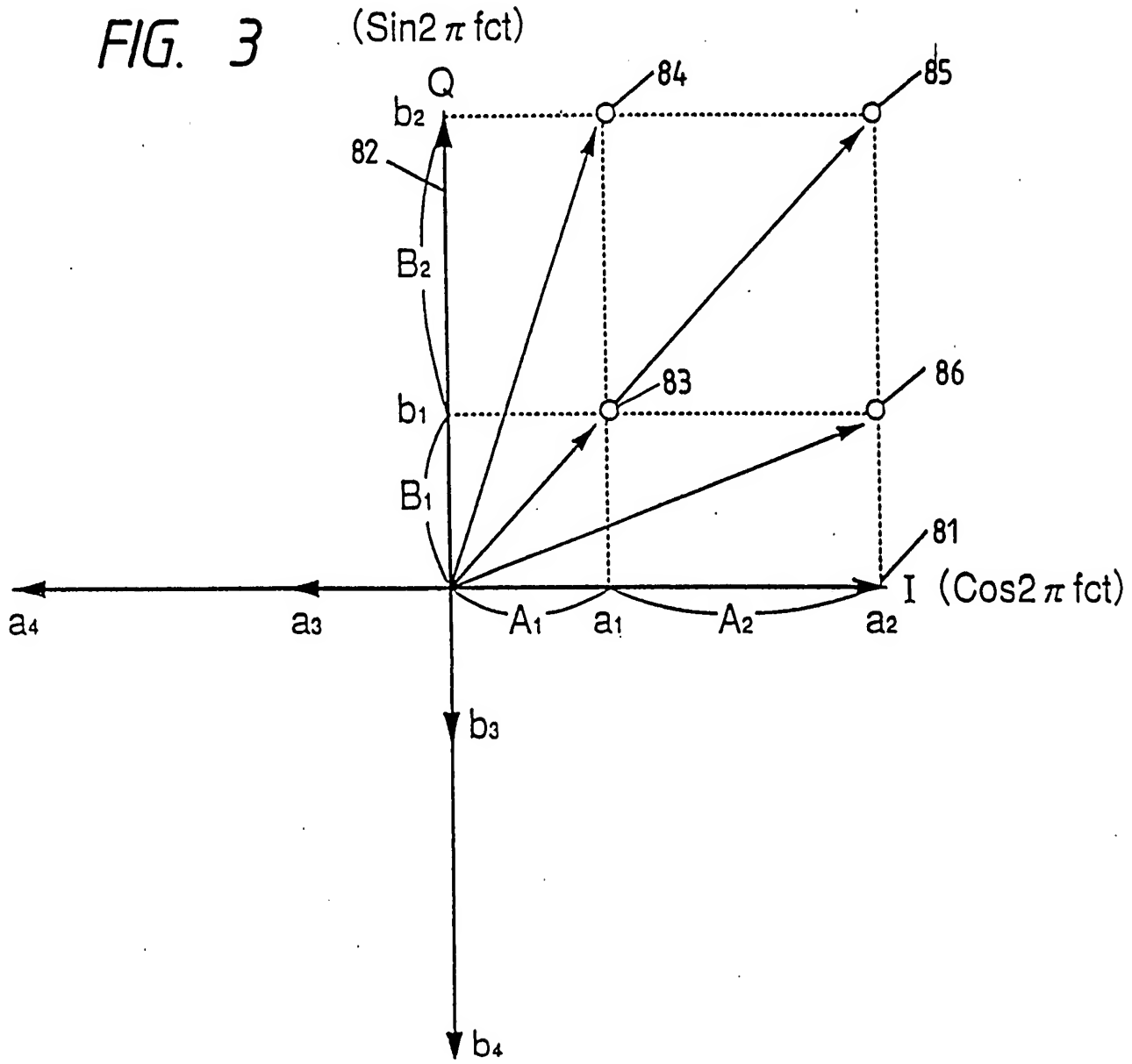

(Sin2 π fct)
Q
b2
82
84
85
B2
b1
83
86
B1
81
I (Cos2 π fct)
a4
a3
A1
a1
A2
a2
b3
b4

FIG. 4

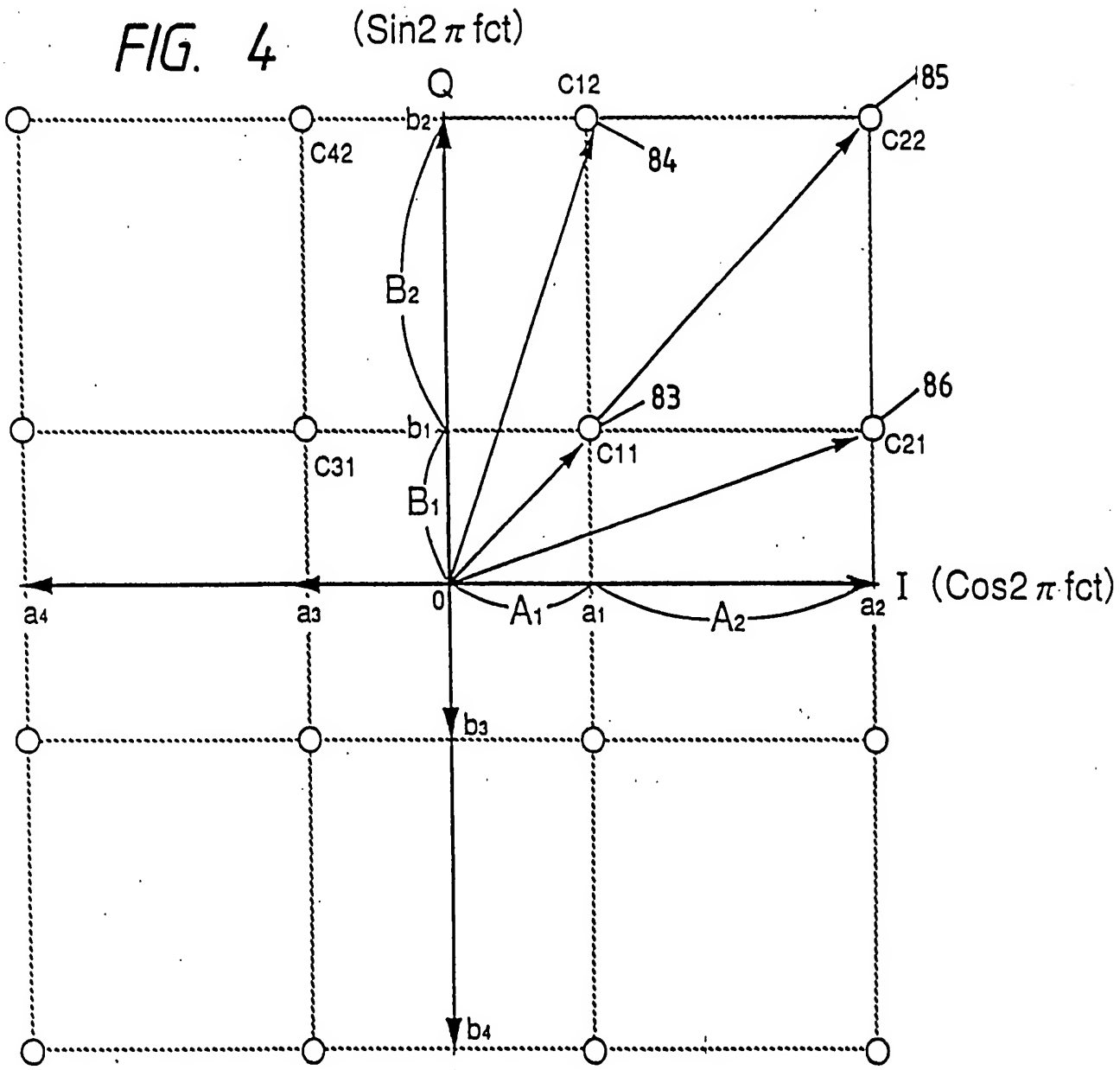

(Sin2 π fct)
Q
C12
85
C42
b2
84
C22
B2
83
86
b1
C11
C21
C31
B1
I (Cos2 π fct)
a4
a3
0
A1
a1
A2
a2
b3
b4

FIG. 5

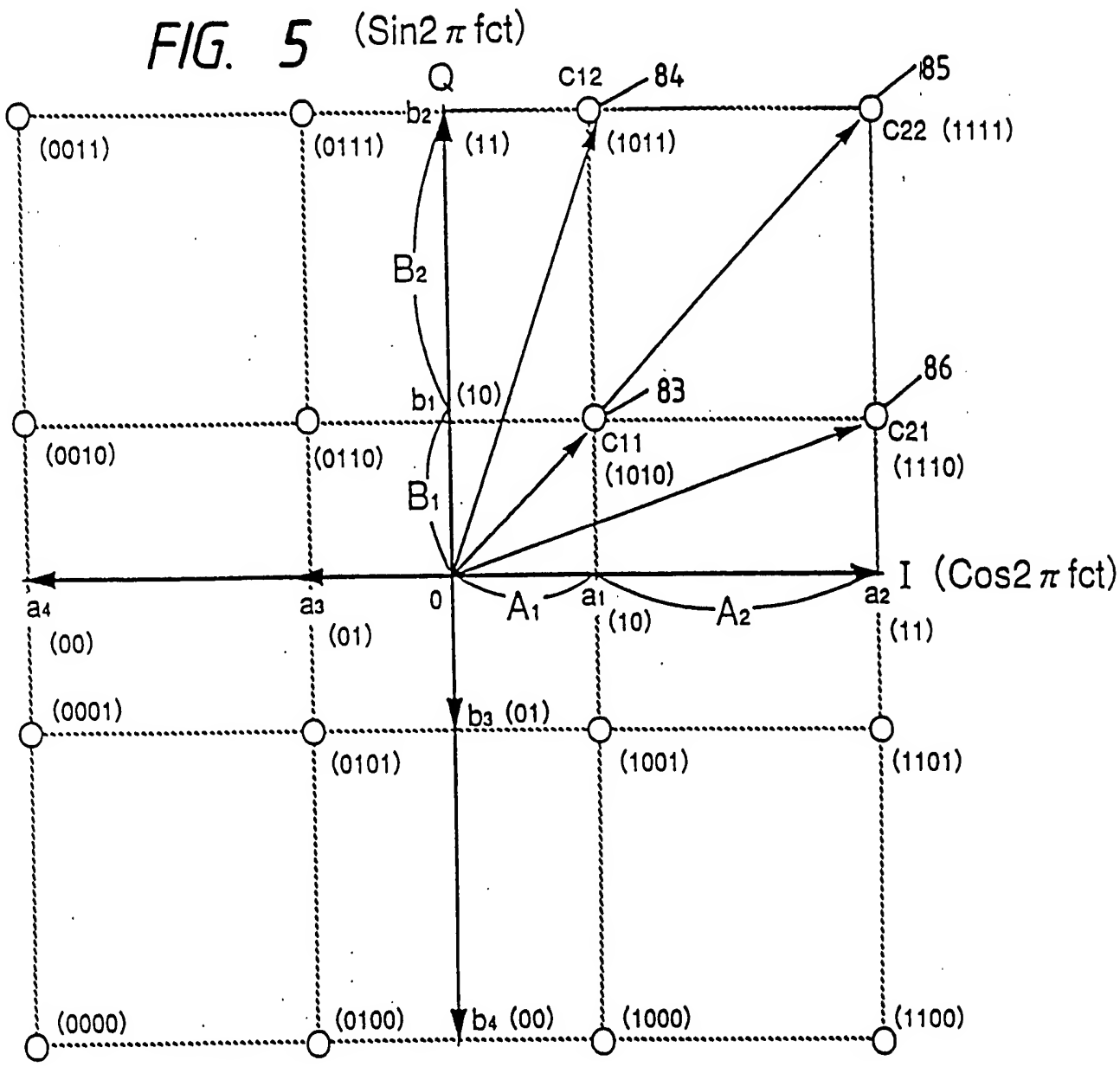

(Sin2 π fct)
Q
C12
84
85
b2
(0011)
(0111)
(11)
(1011)
C22 (1111)
B2
86
b1
(10)
83
(0010)
(0110)
C11
(1010)
C21
(1110)
B1
I (Cos2 π fct)
a4
a3
0
A1
a1
A2
a2
(00)
(01)
(10)
(11)
(0001)
b3 (01)
(0101)
(1001)
(1101)
(0000)
(0100)
b4 (00)
(1000)
(1100)

FIG. 6

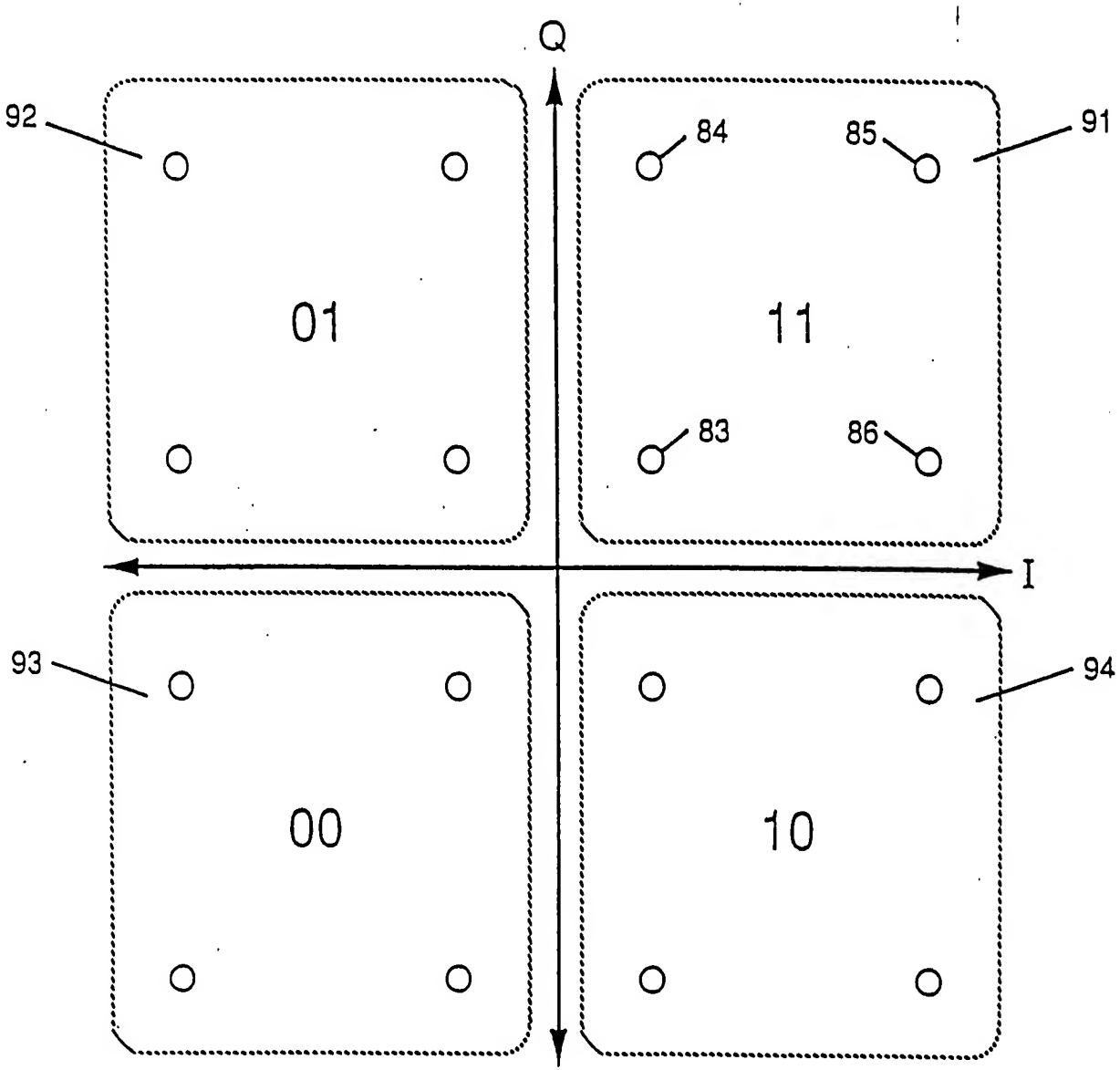


FIG. 7

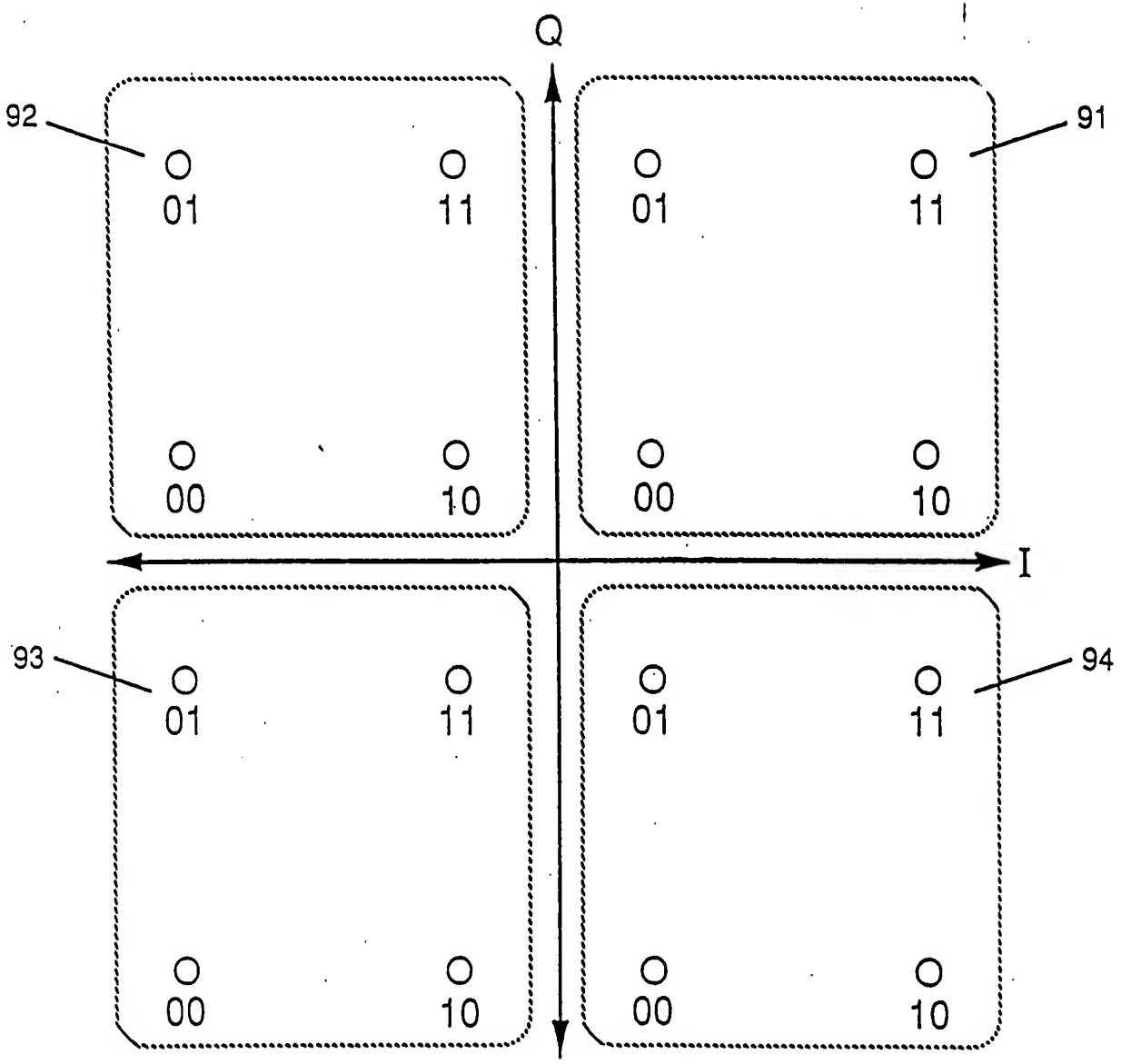


FIG. 8

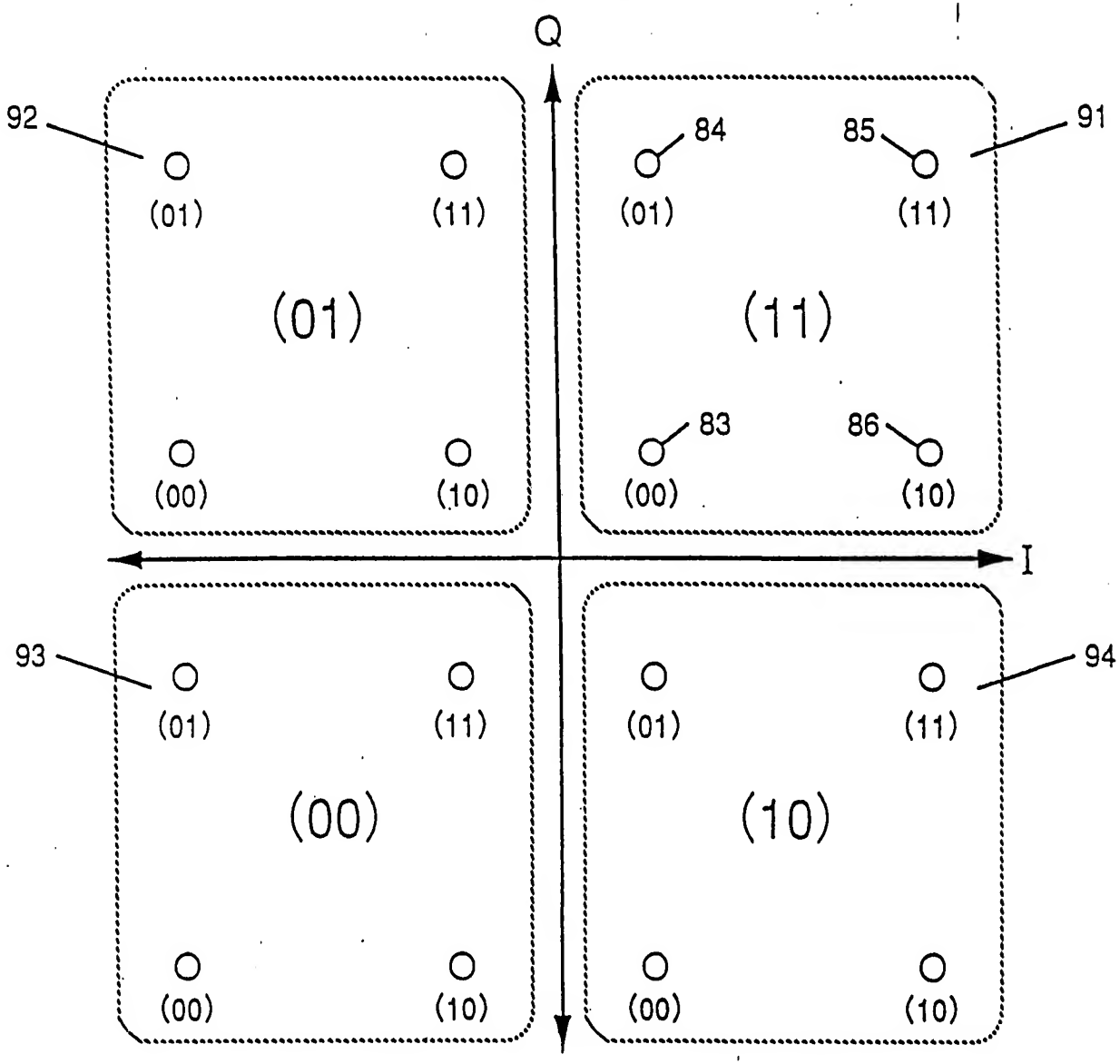


FIG. 9

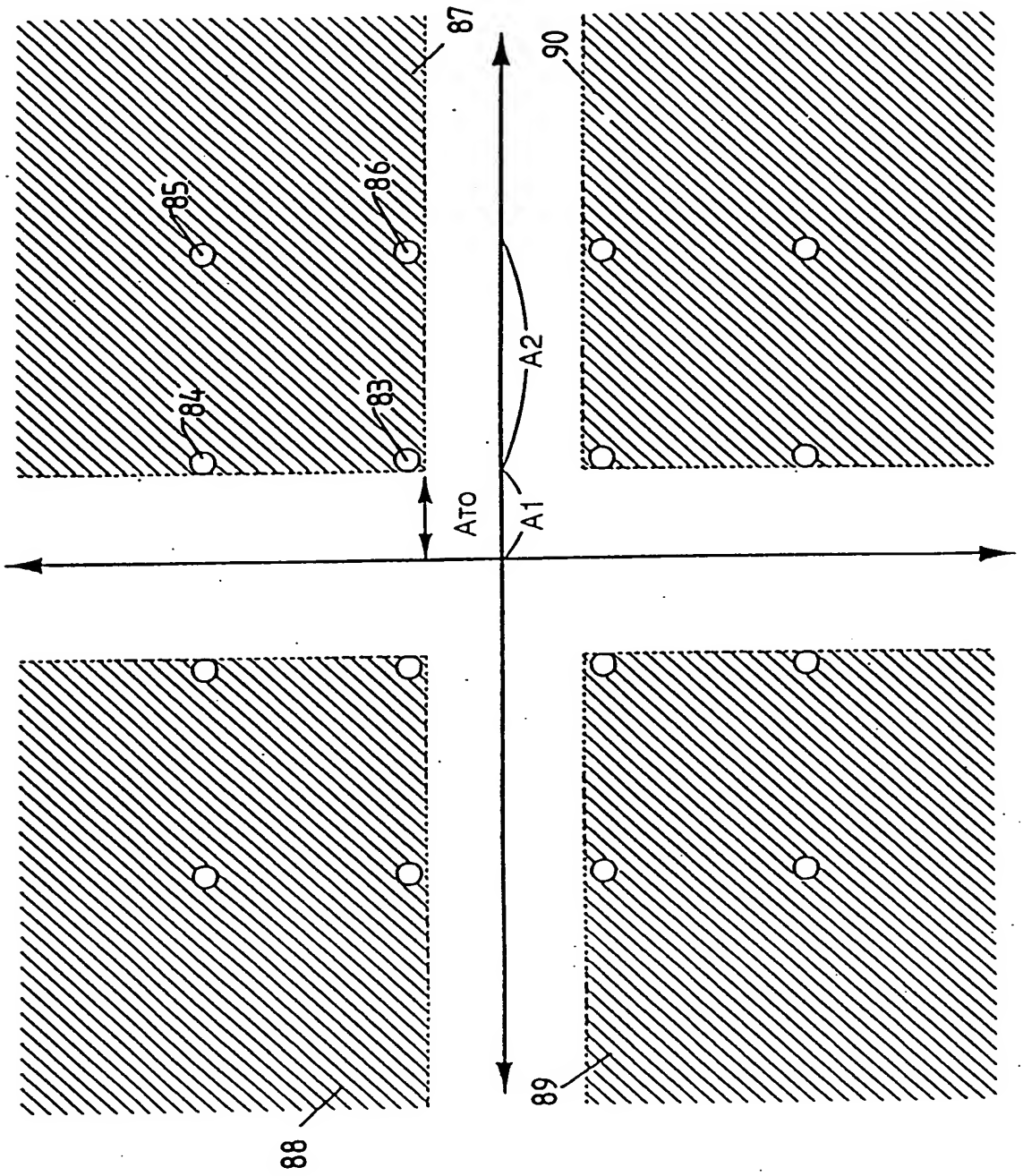


FIG. 10

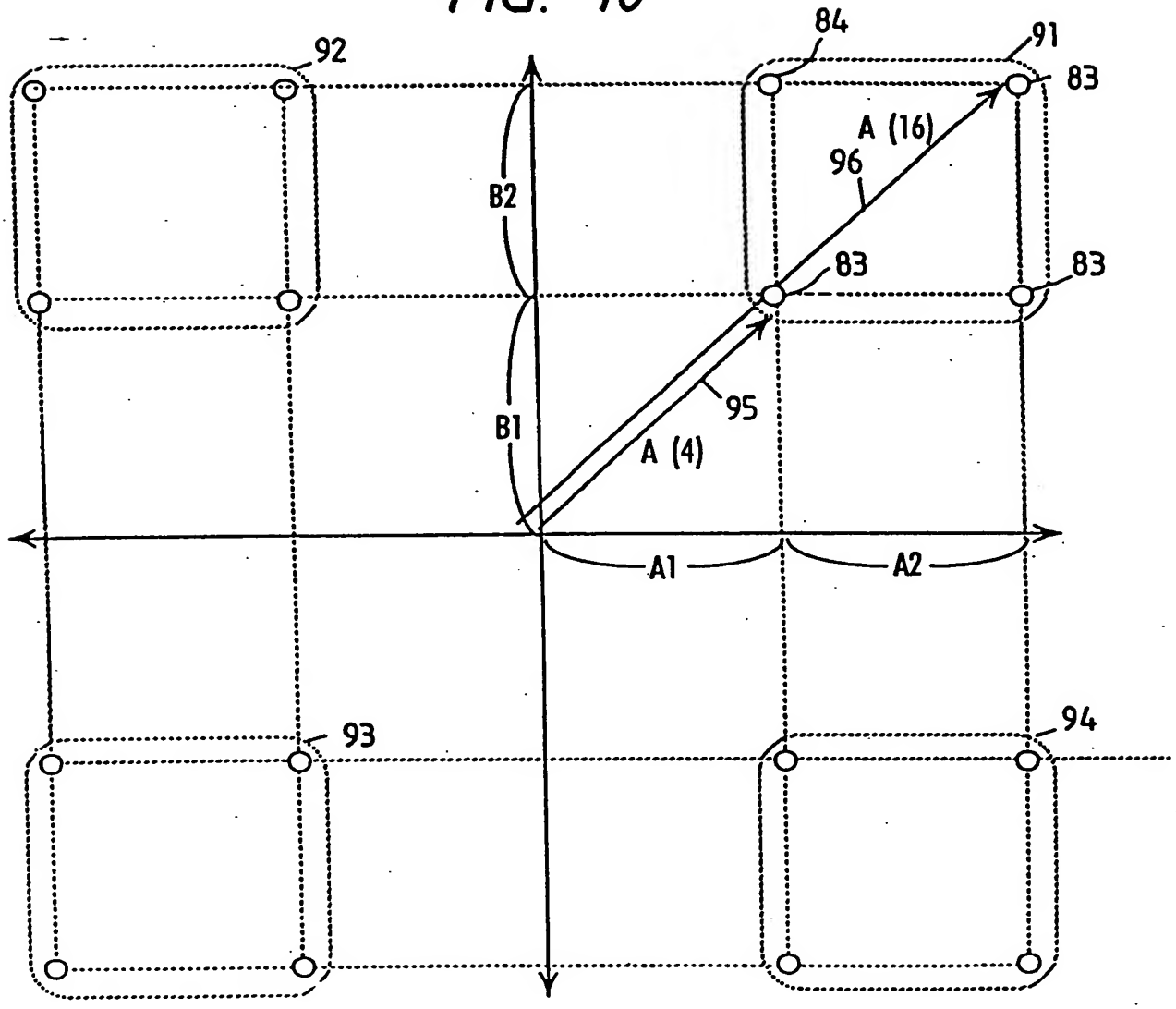


FIG. 11

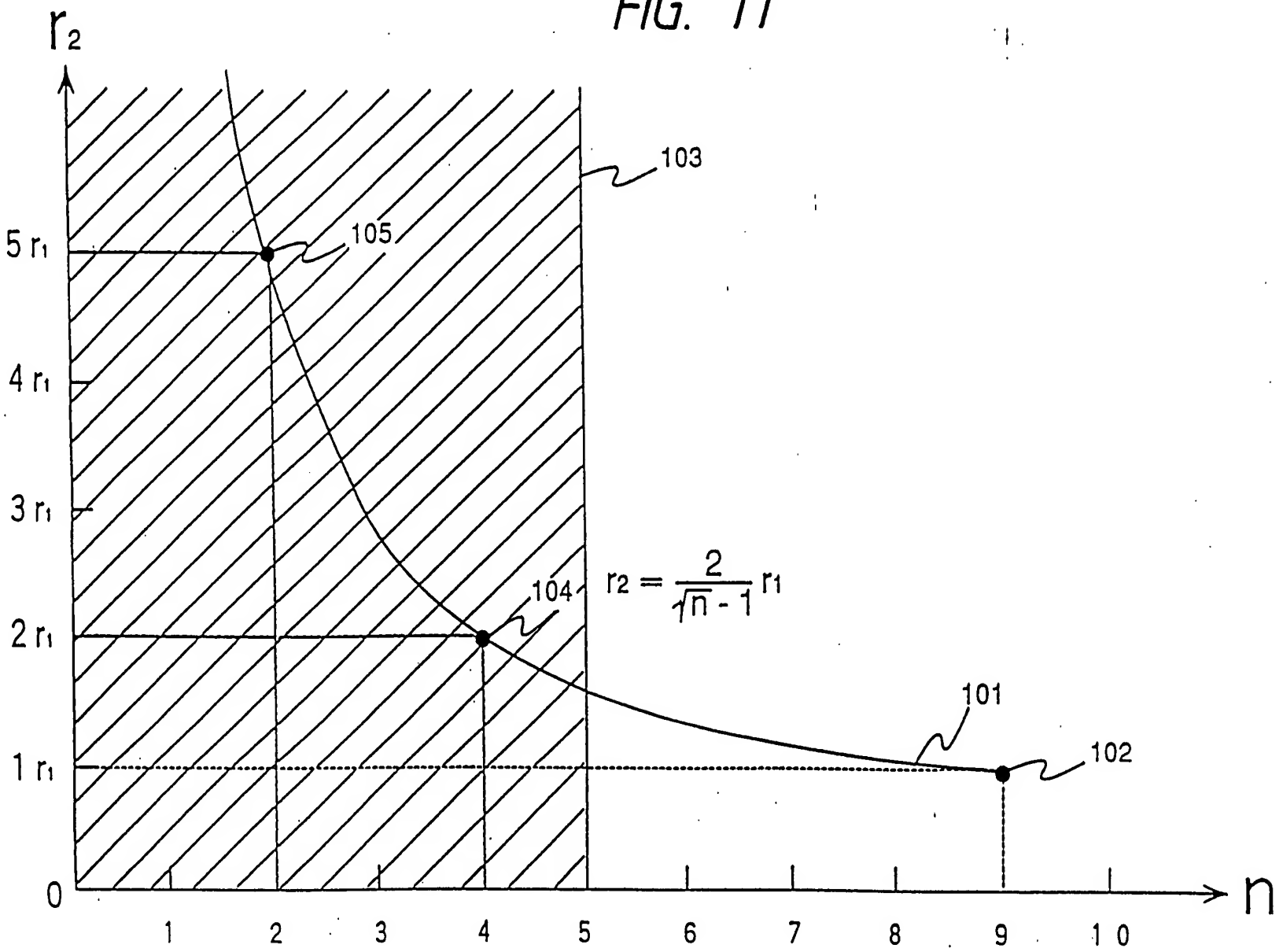

r2
5 r1
4 r1
3 r1
2 r1
1 r1
0
1
2
3
4
5
6
7
8
9
10
n
103
105
104
101
102
r2 = 2 / (√n - 1) r1

FIG. 12

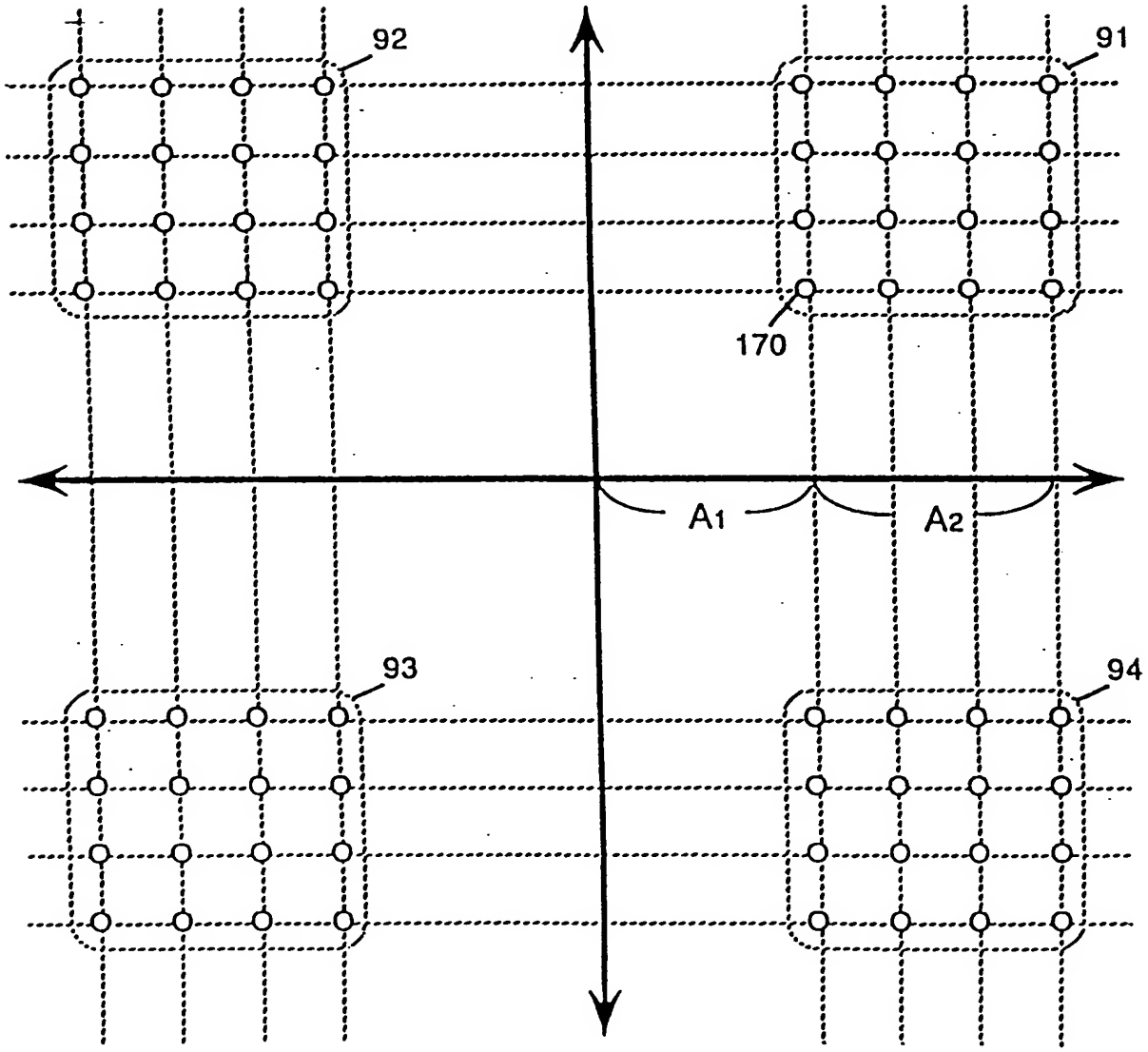


FIG. 13

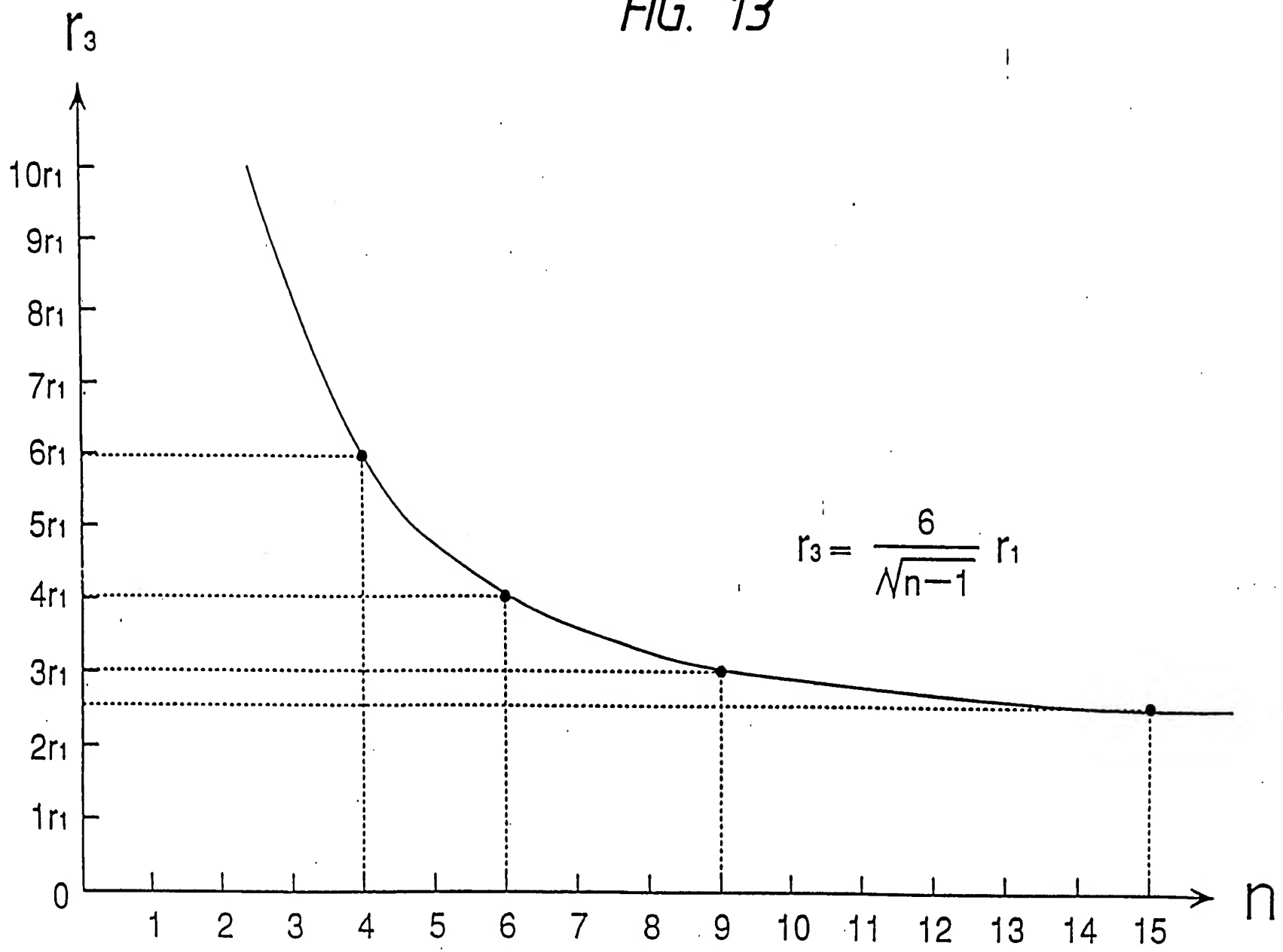

r3
10r1
9r1
8r1
7r1
6r1
5r1
4r1
3r1
2r1
1r1
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
n
r3 = 6 / √(n−1) r1

FIG. 14

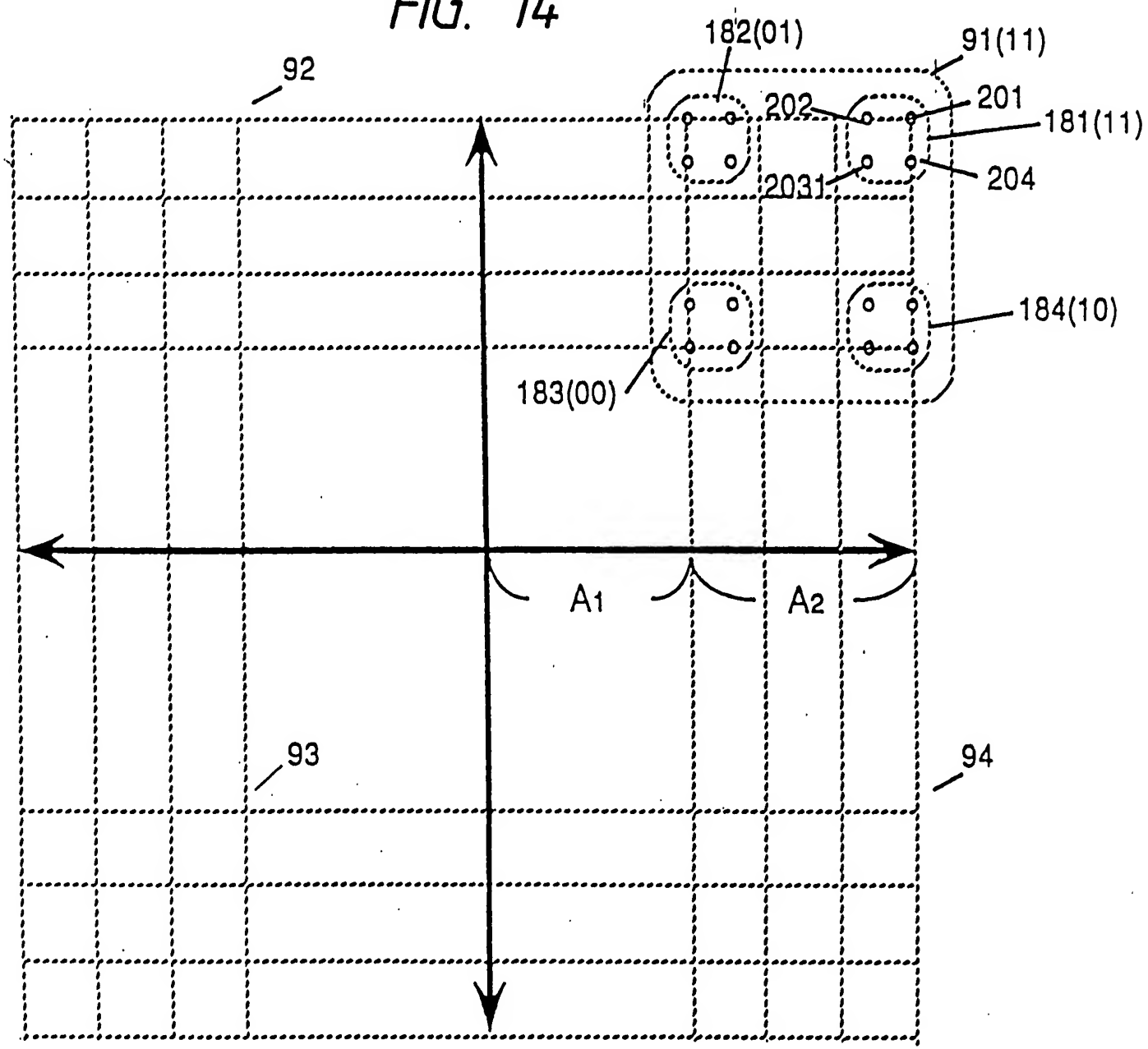


FIG. 15

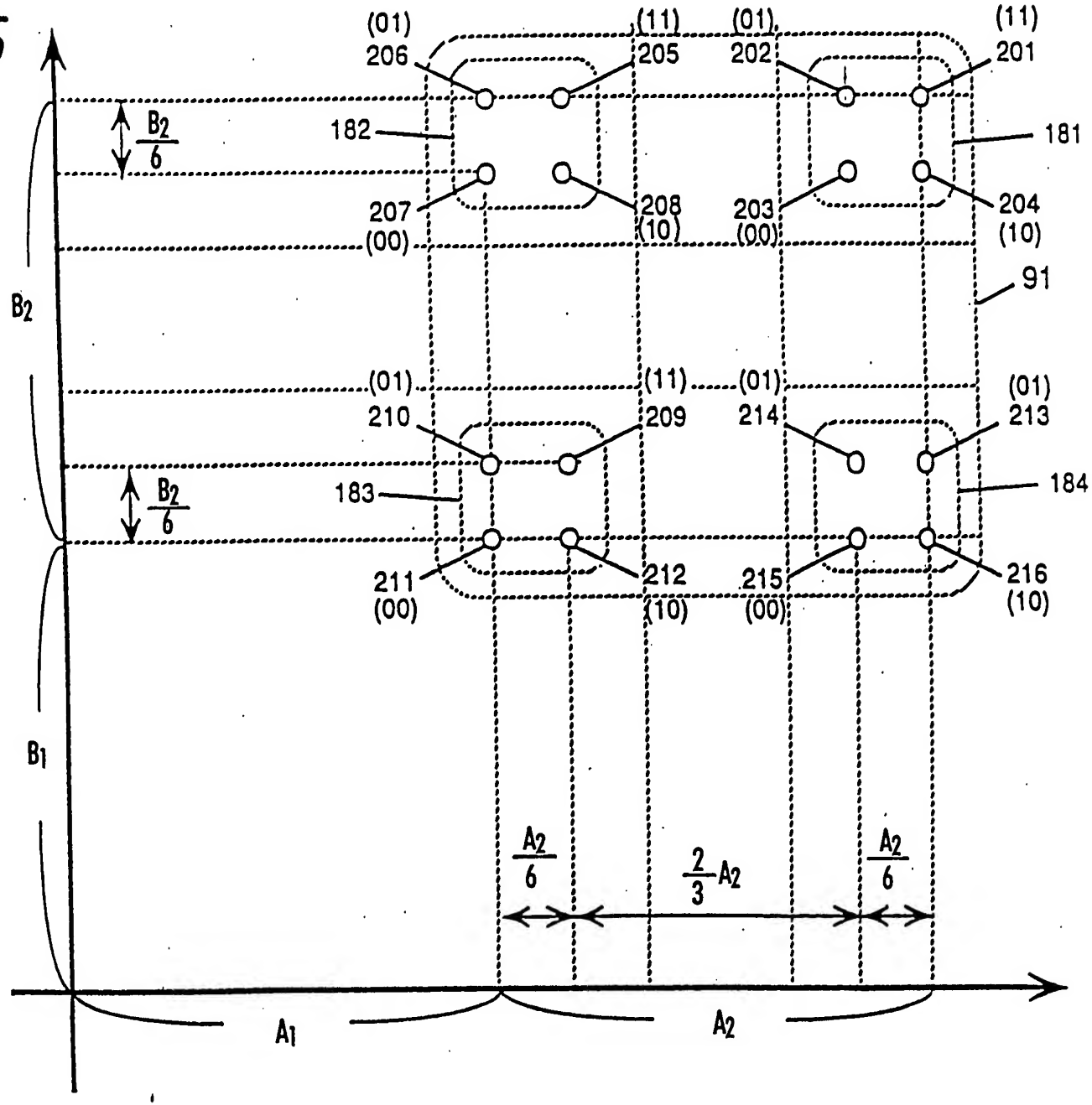

(01)
206
(11)
205
(01)
202
(11)
201
182
181
207
208
(10)
203
(00)
204
(10)
(00)
91
(01)
(11)
(01)
(01)
210
209
214
213
183
184
211
(00)
212
(10)
215
(00)
216
(10)
B2
B2/6
B2/6
B1
A2/6
2/3 A2
A2/6
A1
A2

FIG. 16

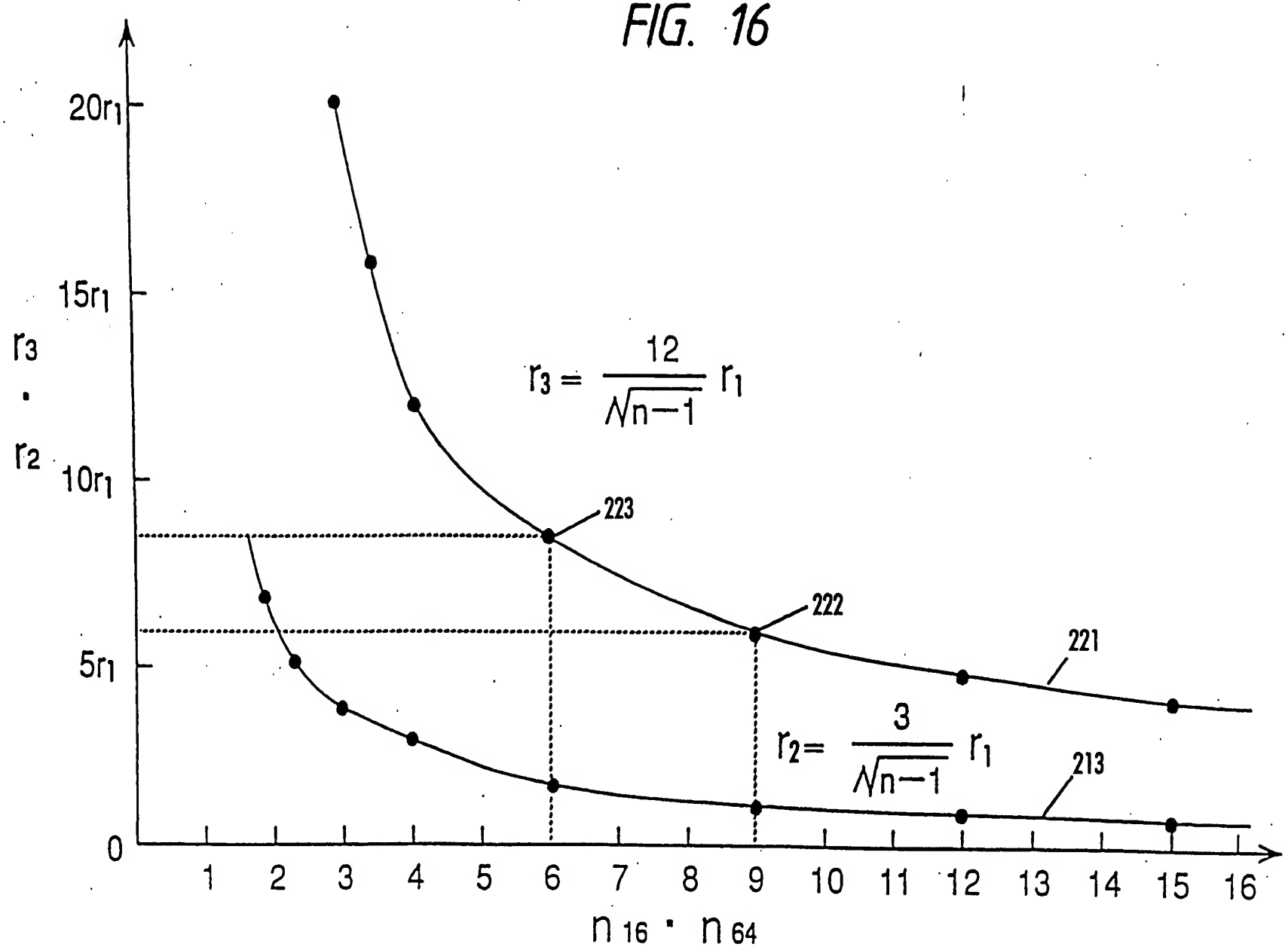

20r1
15r1
10r1
5r1
0
r3
r2
$r_3 = \frac{12}{\sqrt{n-1}} r_1$
$r_2 = \frac{3}{\sqrt{n-1}} r_1$
223
222
221
213
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
n16 · n64

FIG. 17

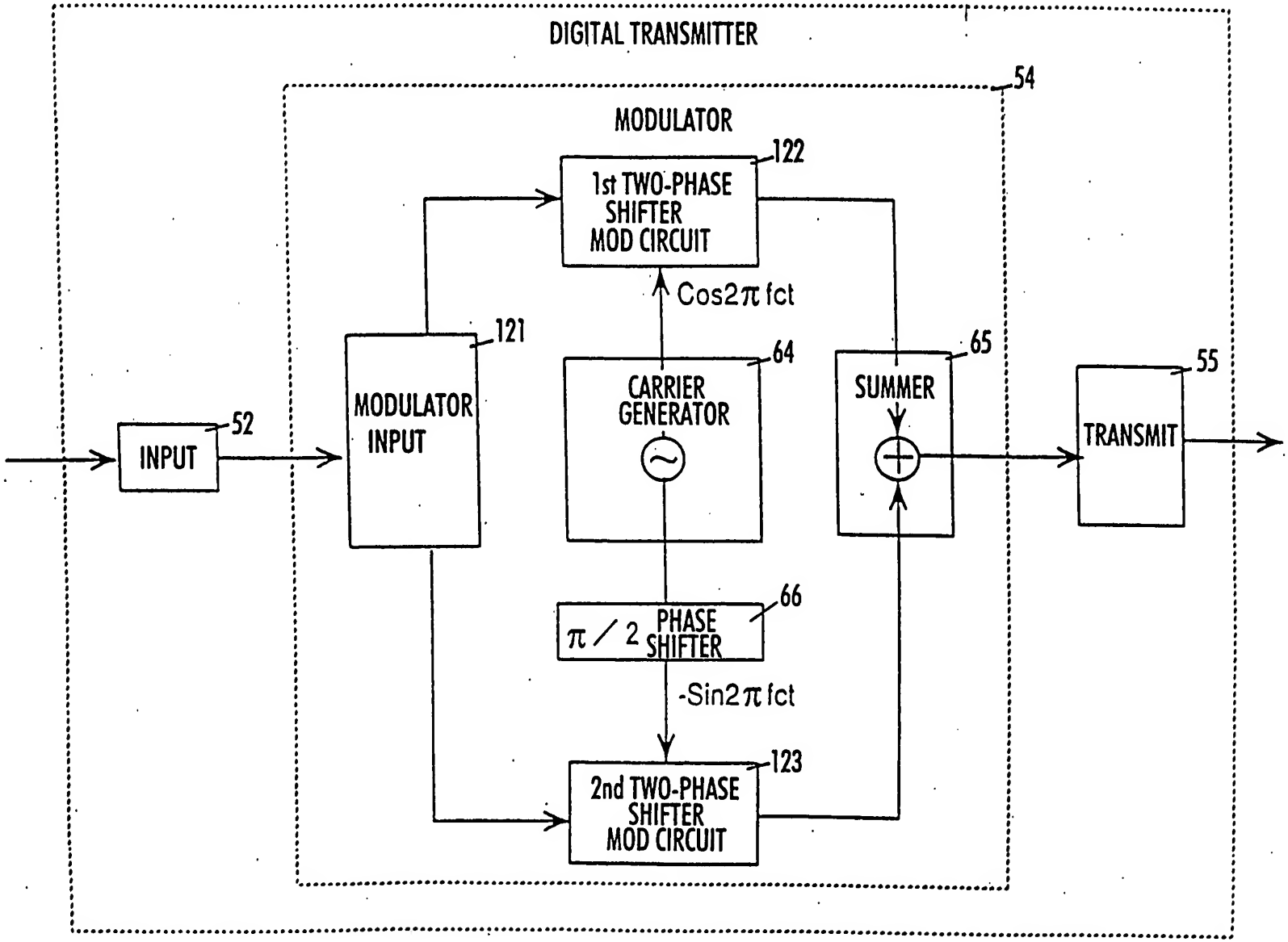

DIGITAL TRANSMITTER
54
MODULATOR
122
1st TWO-PHASE SHIFTER MOD CIRCUIT
Cos2π fct
121
64
65
55
INPUT
52
MODULATOR INPUT
CARRIER GENERATOR
SUMMER
TRANSMIT
66
π / 2 PHASE SHIFTER
-Sin2π fct
123
2nd TWO-PHASE SHIFTER MOD CIRCUIT

FIG. 18

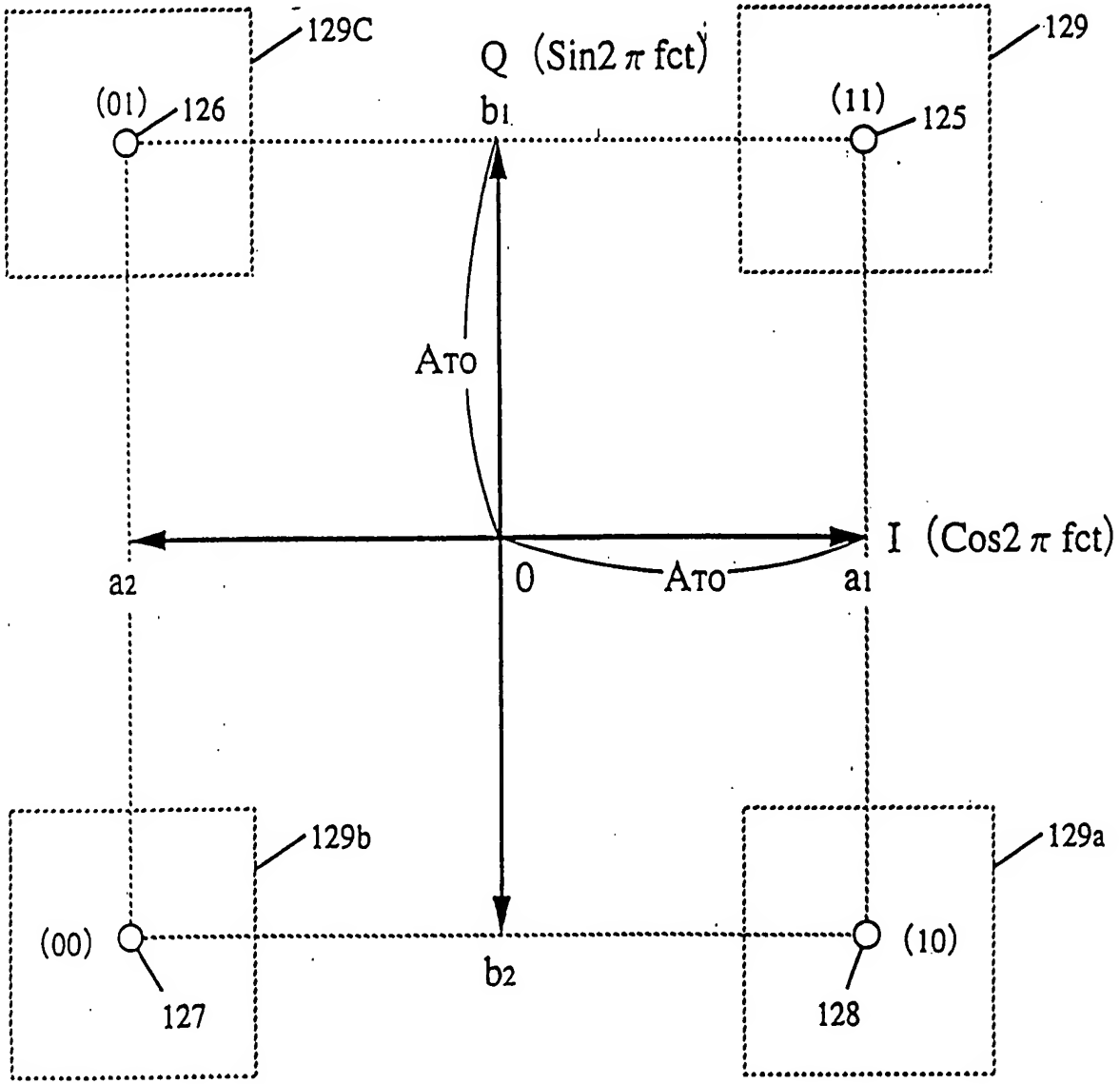

129C
Q (Sin2 π fct)
129
(01)
126
b1
(11)
125
ATO
I (Cos2 π fct)
a2
0
ATO
a1
129b
129a
(00)
(10)
b2
127
128

FIG. 19

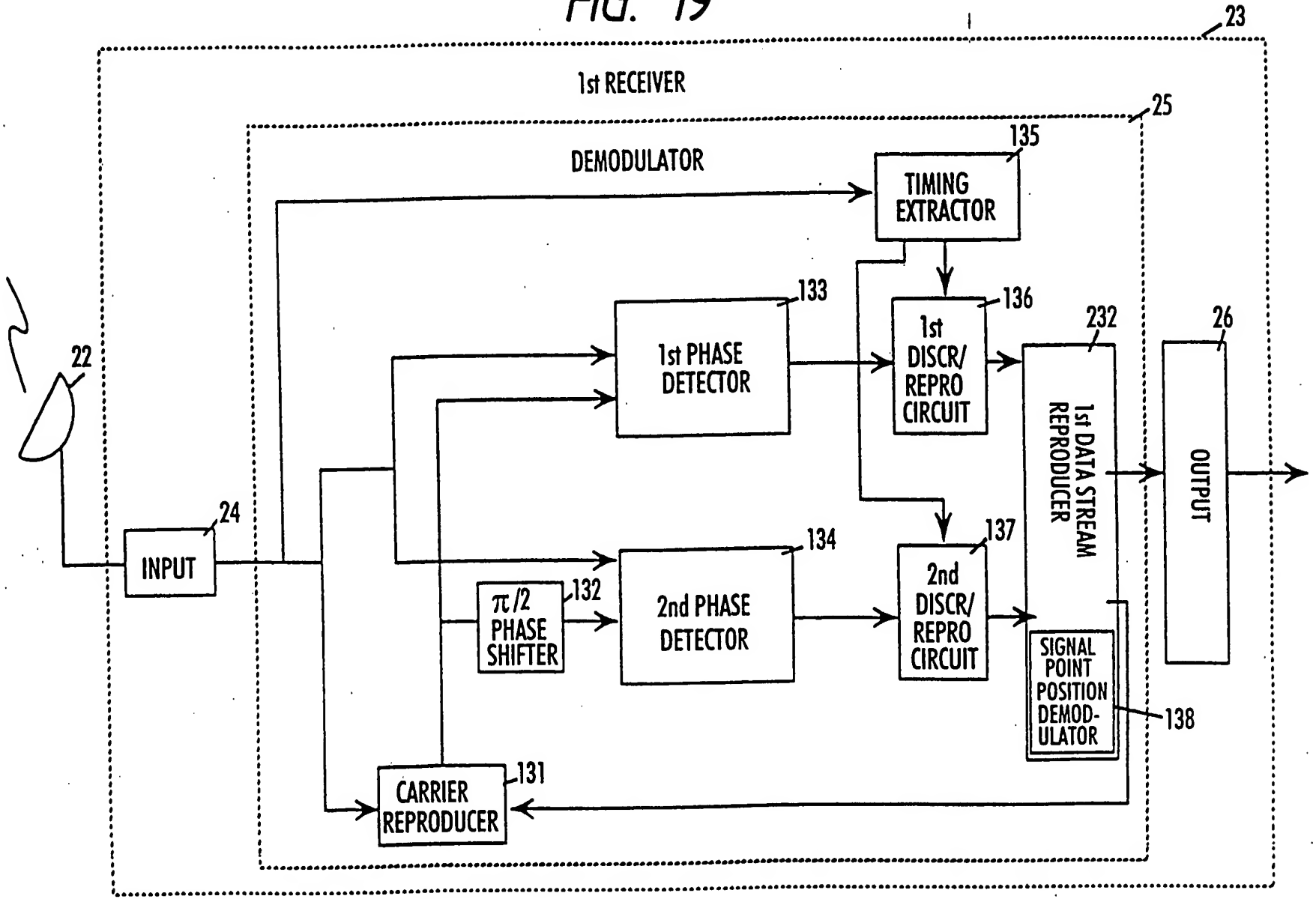

23
1st RECEIVER
25
DEMODULATOR
135
TIMING EXTRACTOR
133
1st PHASE DETECTOR
136
1st DISCR/ REPRO CIRCUIT
232
1st DATA STREAM REPRODUCER
26
OUTPUT
22
24
INPUT
134
2nd PHASE DETECTOR
137
2nd DISCR/ REPRO CIRCUIT
π/2 PHASE SHIFTER
132
SIGNAL POINT POSITION DEMOD-ULATOR
138
CARRIER REPRODUCER
131

FIG. 20

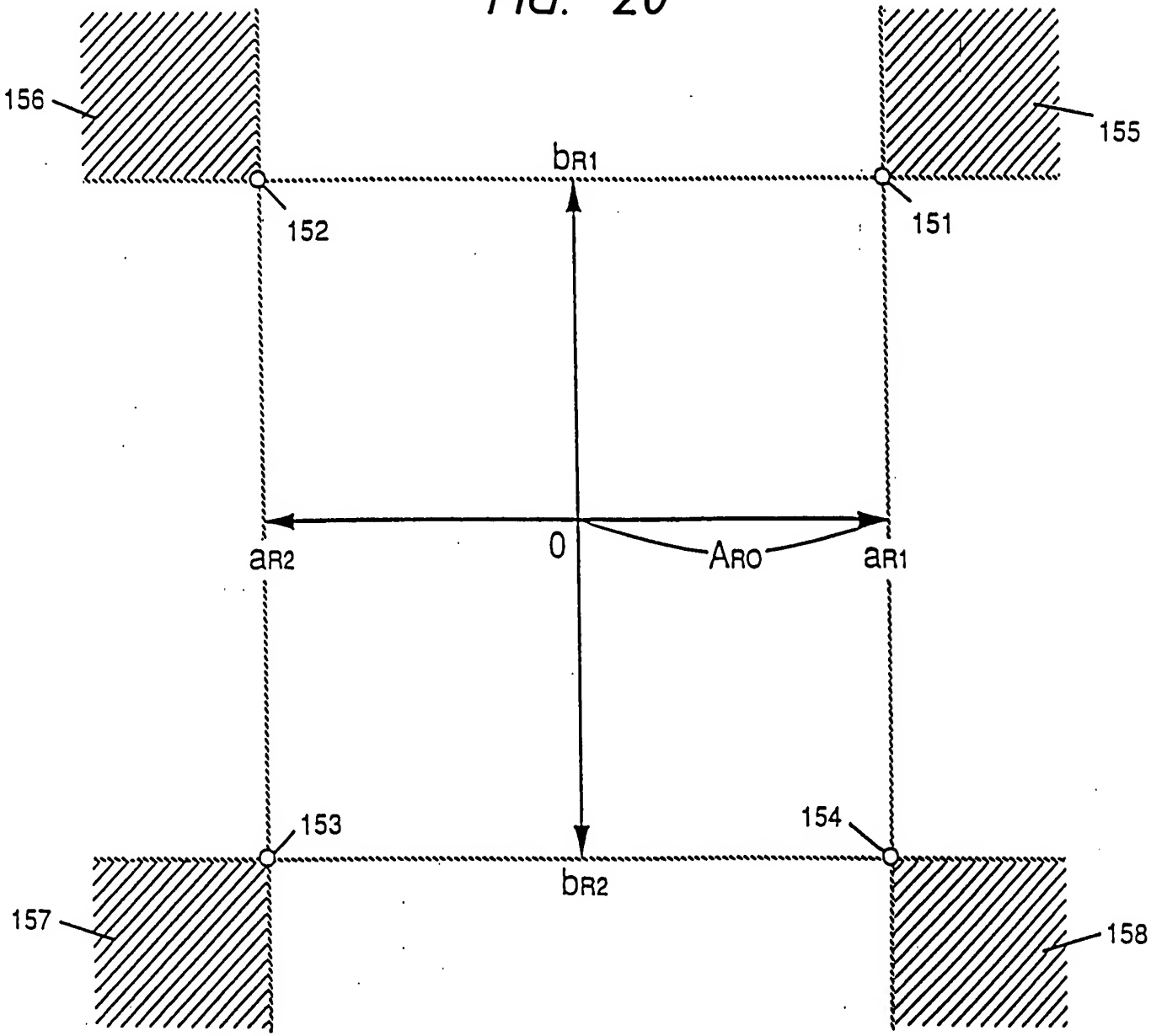


FIG. 21

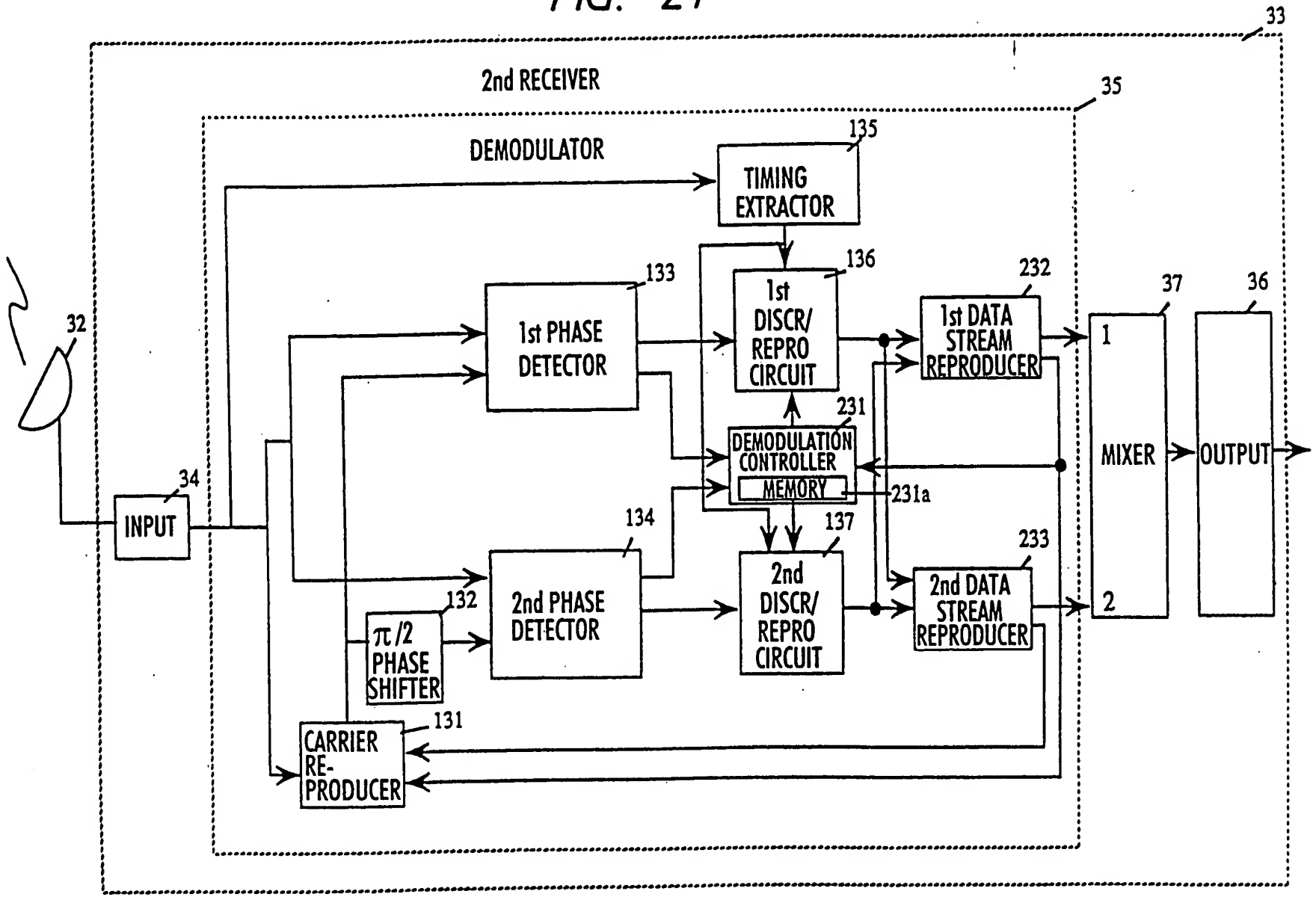

33
2nd RECEIVER
35
DEMODULATOR
135
TIMING EXTRACTOR
136
1st DISCR/ REPRO CIRCUIT
133
1st PHASE DETECTOR
232
1st DATA STREAM REPRODUCER
37
36
32
1
MIXER
OUTPUT
231
DEMODULATION CONTROLLER
MEMORY
231a
34
INPUT
134
137
233
2nd DISCR/ REPRO CIRCUIT
2nd PHASE DETECTOR
2nd DATA STREAM REPRODUCER
2
132
π/2 PHASE SHIFTER
131
CARRIER RE-PRODUCER

FIG. 22

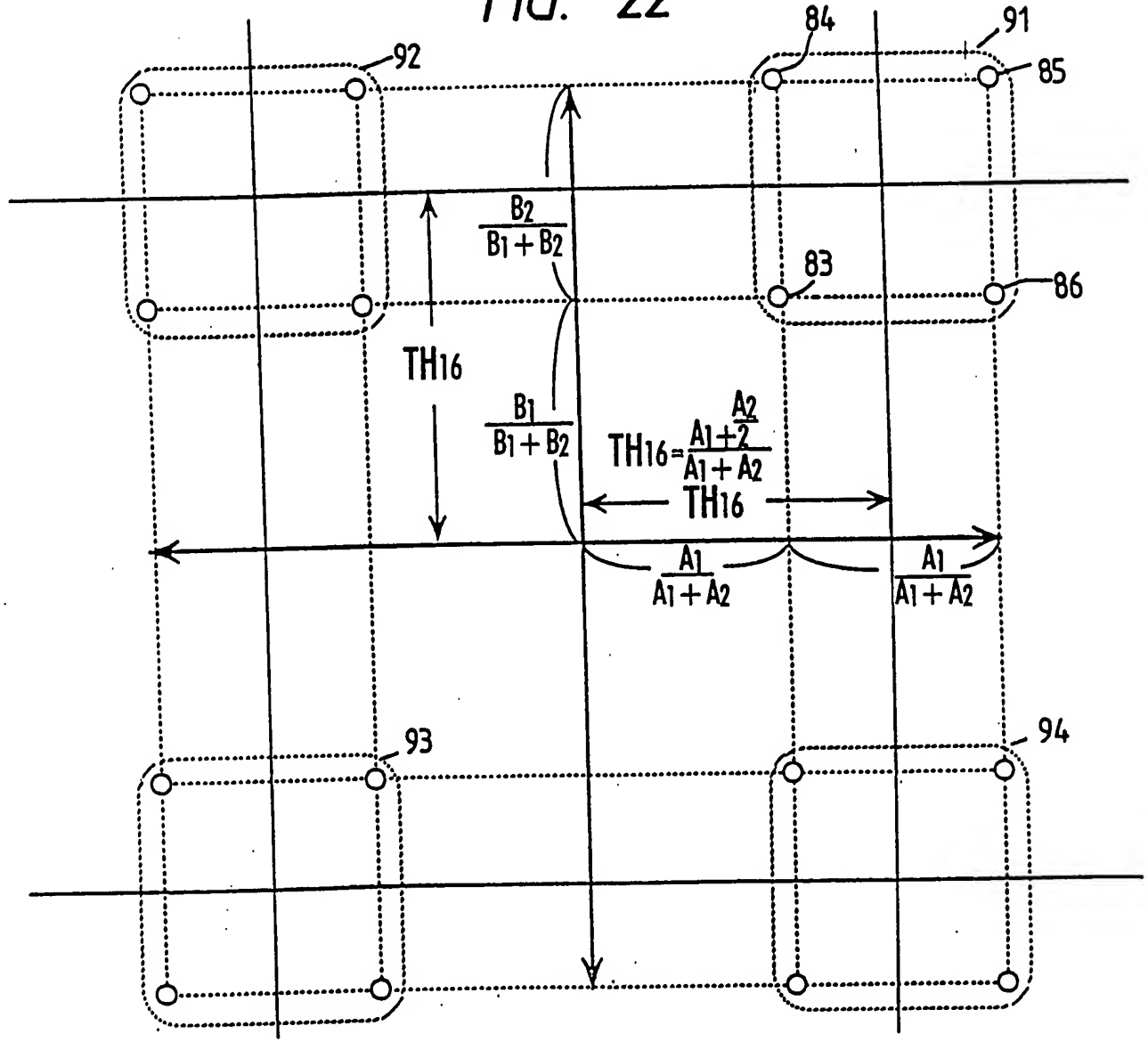

84
91
92
85
$\frac{B_2}{B_1+B_2}$
83
86
TH16
$\frac{B_1}{B_1+B_2}$
$TH16=\frac{\frac{A_2}{2}}{A_1+A_2}$
TH16
$\frac{A_1}{A_1+A_2}$
$\frac{A_1}{A_1+A_2}$
93
94

FIG. 23

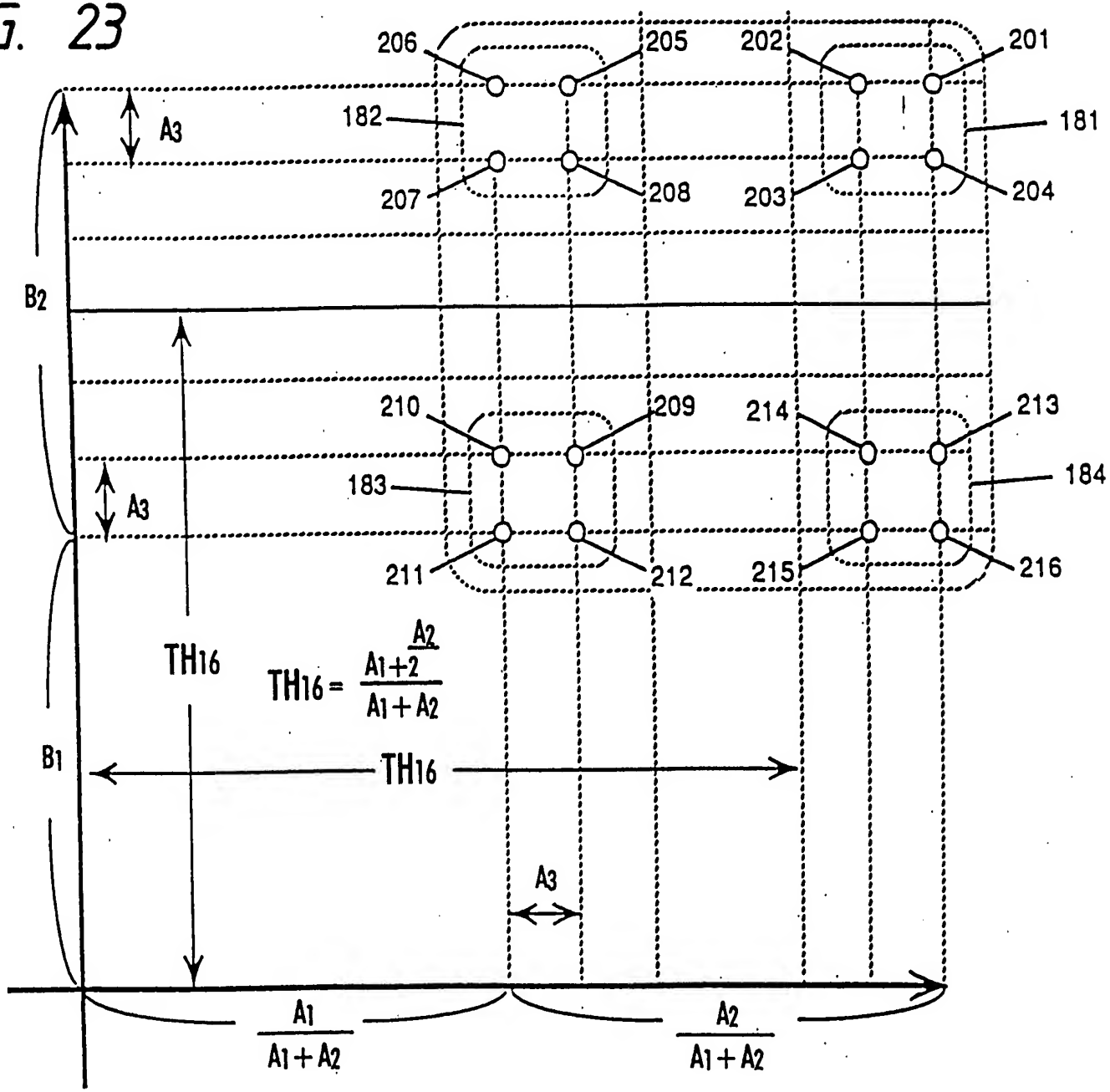

206
205
202
201
182
181
A3
207
208
203
204
B2
210
209
214
213
183
184
A3
211
212
215
216
TH16
$TH16 = \frac{A2}{A1+2}$
$\frac{A2}{A1+A2}$
B1
TH16
A3
$\frac{A1}{A1+A2}$
$\frac{A2}{A1+A2}$

FIG. 24

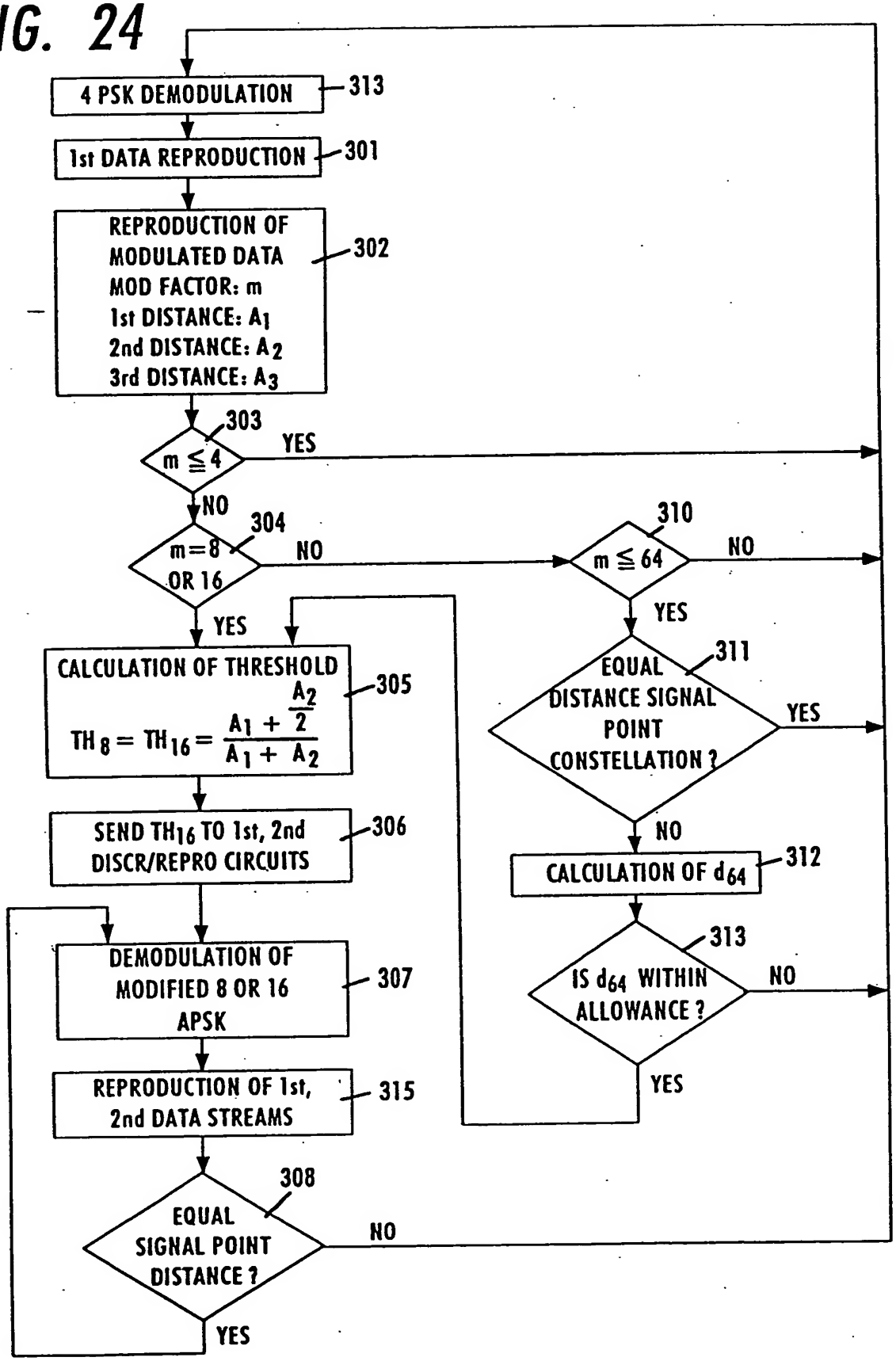

4 PSK DEMODULATION
313
1st DATA REPRODUCTION
301
REPRODUCTION OF MODULATED DATA
MOD FACTOR: m
1st DISTANCE: A_1
2nd DISTANCE: A_2
3rd DISTANCE: A_3
302
303
$m \leqq 4$
YES
NO
304
m=8 OR 16
NO
310
$m \leqq 64$
NO
YES
YES
CALCULATION OF THRESHOLD
$TH_8 = TH_{16} = \frac{A_1 + \frac{A_2}{2}}{A_1 + A_2}$
305
311
EQUAL DISTANCE SIGNAL POINT CONSTELLATION ?
YES
SEND TH_{16} TO 1st, 2nd DISCR/REPRO CIRCUITS
306
NO
CALCULATION OF d_{64}
312
DEMODULATION OF MODIFIED 8 OR 16 APSK
307
313
IS d_{64} WITHIN ALLOWANCE ?
NO
REPRODUCTION OF 1st, 2nd DATA STREAMS
315
YES
308
EQUAL SIGNAL POINT DISTANCE ?
NO
YES

FIG. 25(A)

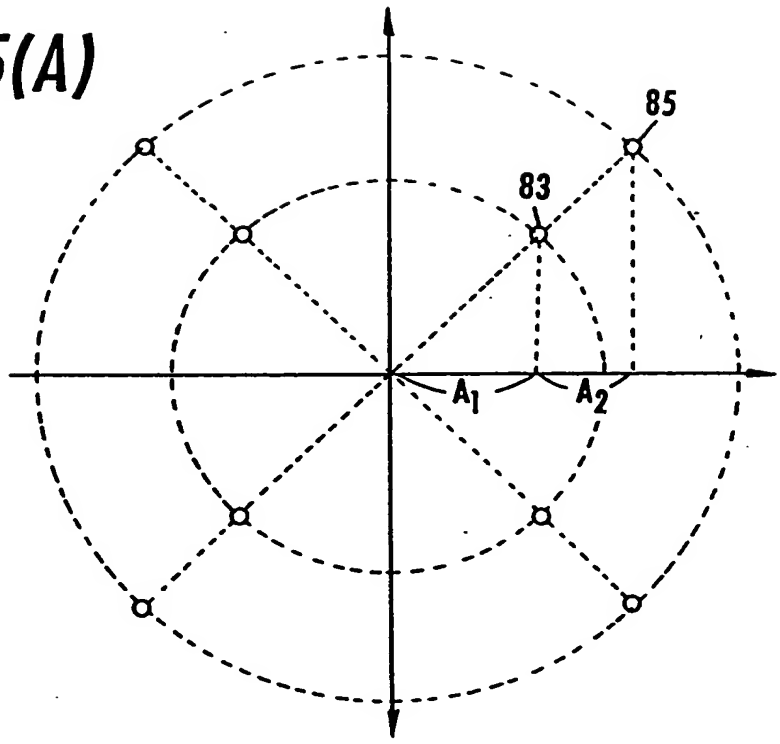


FIG. 25(B)

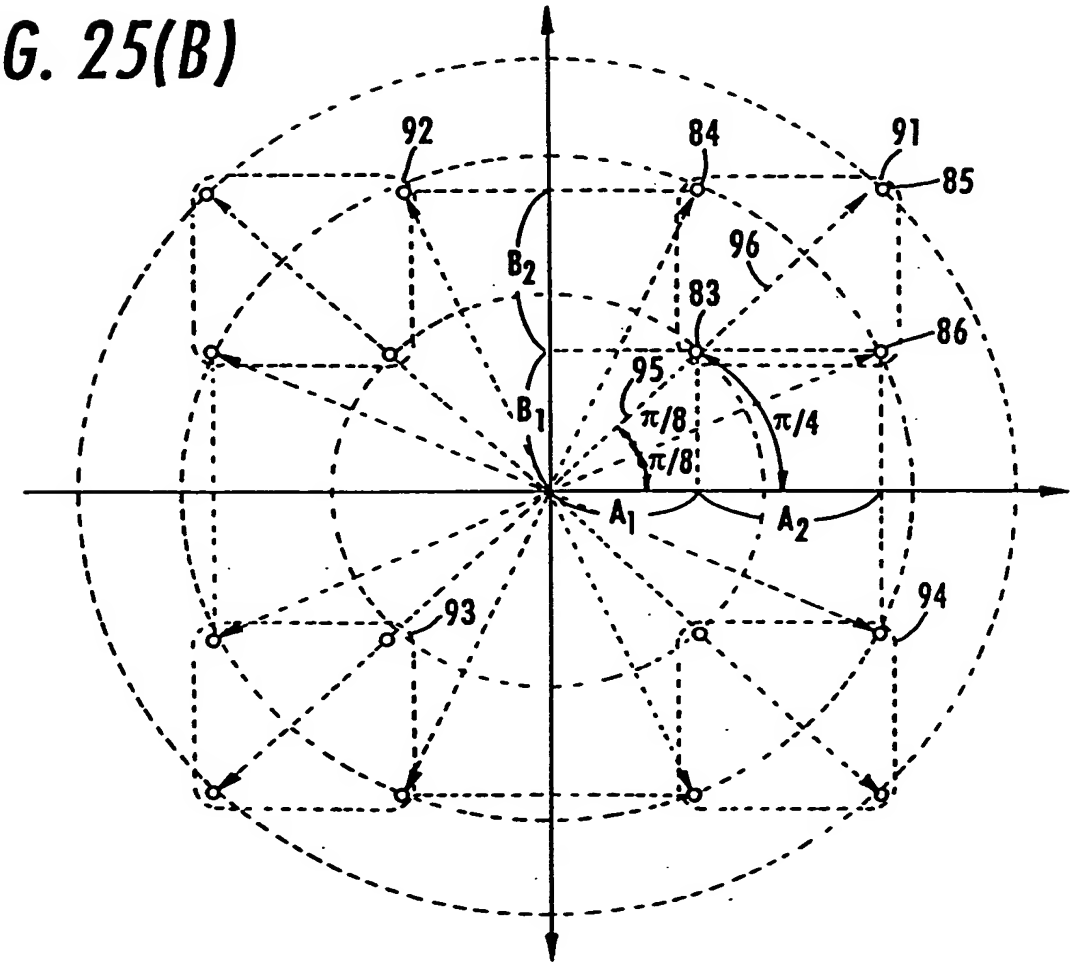


FIG. 26

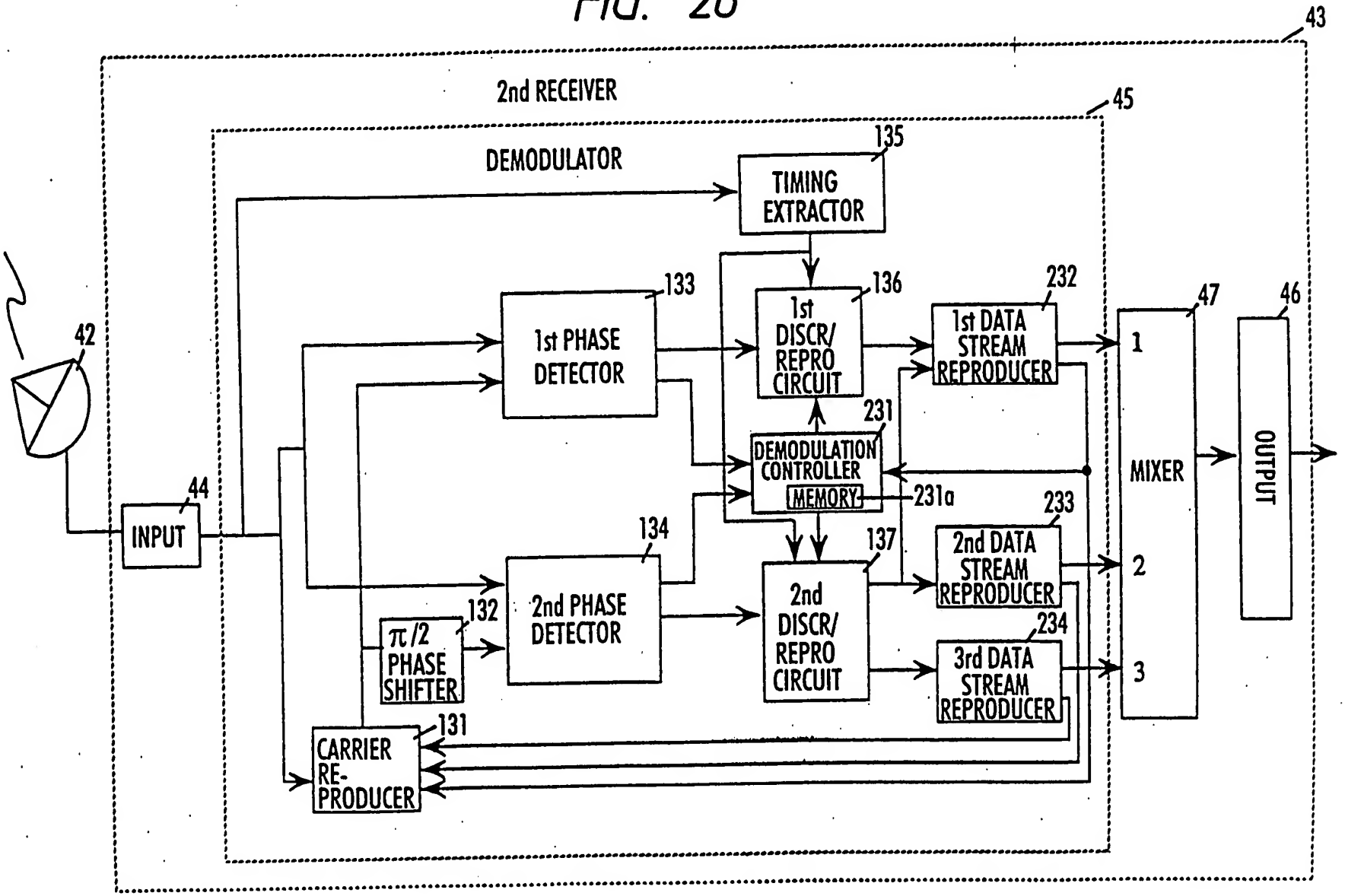
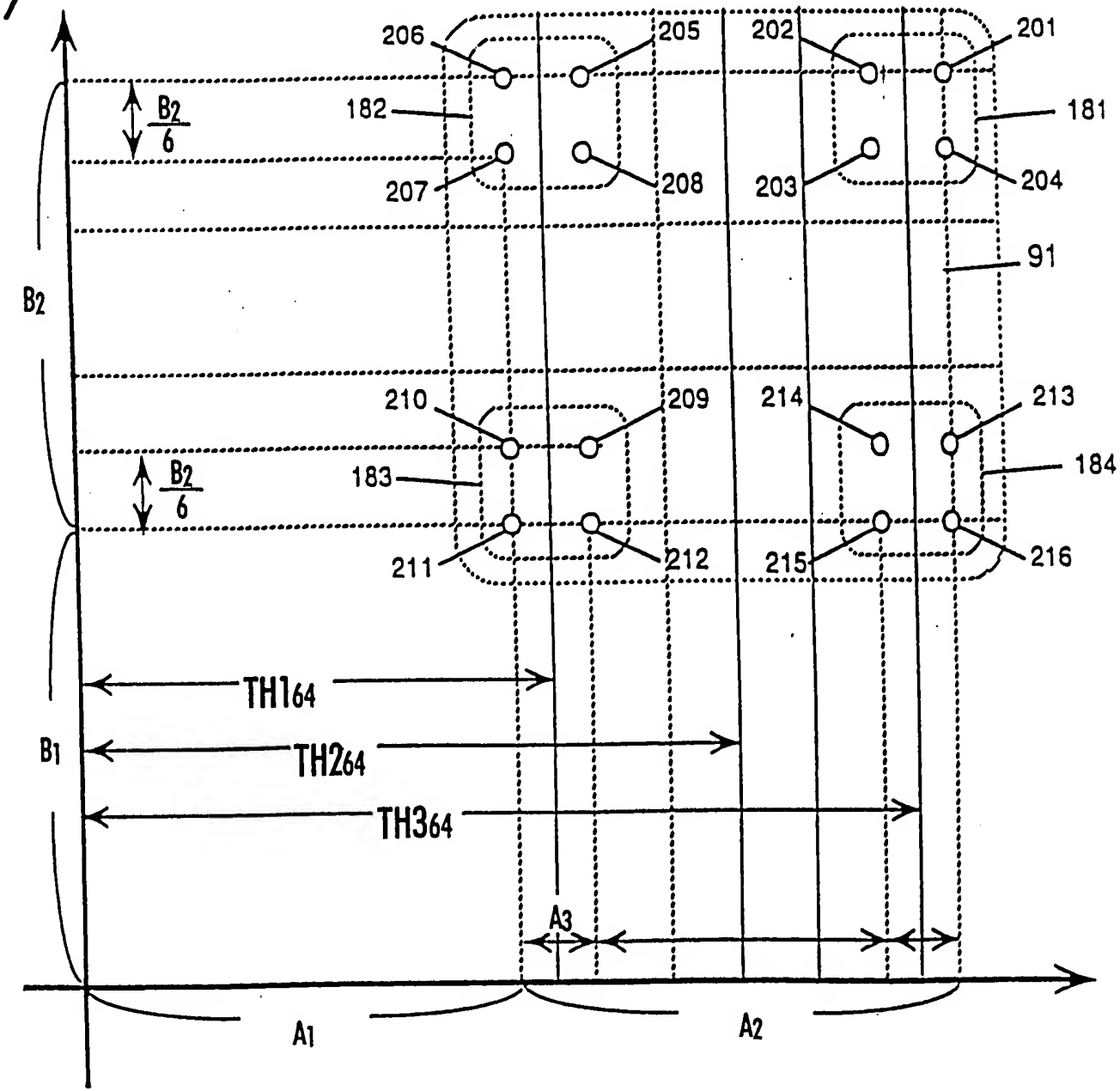

43
2nd RECEIVER
45
DEMODULATOR
135
TIMING EXTRACTOR
133
1st PHASE DETECTOR
136
1st DISCR/ REPRO CIRCUIT
232
1st DATA STREAM REPRODUCER
47
46
42
231
DEMODULATION CONTROLLER
MEMORY
231a
44
INPUT
134
137
233
2nd DATA STREAM REPRODUCER
2nd PHASE DETECTOR
2nd DISCR/ REPRO CIRCUIT
1
MIXER
2
3
OUTPUT
132
π/2 PHASE SHIFTER
234
3rd DATA STREAM REPRODUCER
131
CARRIER RE-PRODUCER

FIG. 27


206
205
202
201
182
181
207
208
203
204
91
210
209
214
213
183
184
211
212
215
216
B2
B2/6
B2/6
B1
TH164
TH264
TH364
A3
A1
A2

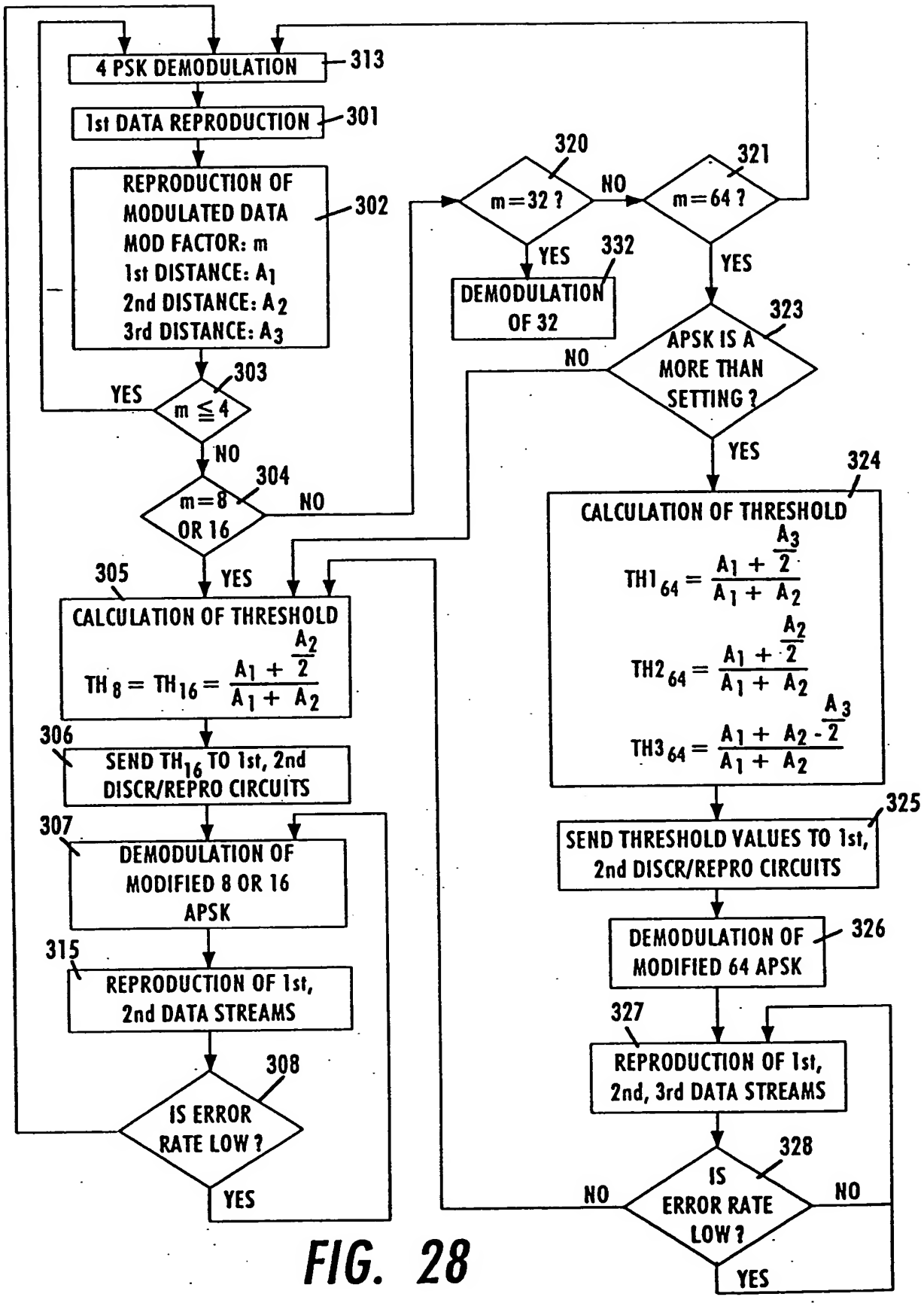

4 PSK DEMODULATION
313
1st DATA REPRODUCTION
301
REPRODUCTION OF MODULATED DATA
MOD FACTOR: m
1st DISTANCE: A1
2nd DISTANCE: A2
3rd DISTANCE: A3
302
m≦4 ?
303
YES
NO
m=8 OR 16 ?
304
NO
YES
CALCULATION OF THRESHOLD
305
TH8 = TH16 = (A1 + A2/2) / (A1 + A2)
SEND TH16 TO 1st, 2nd DISCR/REPRO CIRCUITS
306
DEMODULATION OF MODIFIED 8 OR 16 APSK
307
REPRODUCTION OF 1st, 2nd DATA STREAMS
315
IS ERROR RATE LOW ?
308
YES
m=32 ?
320
NO
m=64 ?
321
YES
DEMODULATION OF 32
332
YES
APSK IS A MORE THAN SETTING ?
323
NO
YES
CALCULATION OF THRESHOLD
324
TH1 64 = (A1 + A3/2) / (A1 + A2)
TH2 64 = (A1 + A2/2) / (A1 + A2)
TH3 64 = (A1 + A2 - A3/2) / (A1 + A2)
SEND THRESHOLD VALUES TO 1st, 2nd DISCR/REPRO CIRCUITS
325
DEMODULATION OF MODIFIED 64 APSK
326
REPRODUCTION OF 1st, 2nd, 3rd DATA STREAMS
327
IS ERROR RATE LOW ?
328
NO
NO
YES

FIG. 28

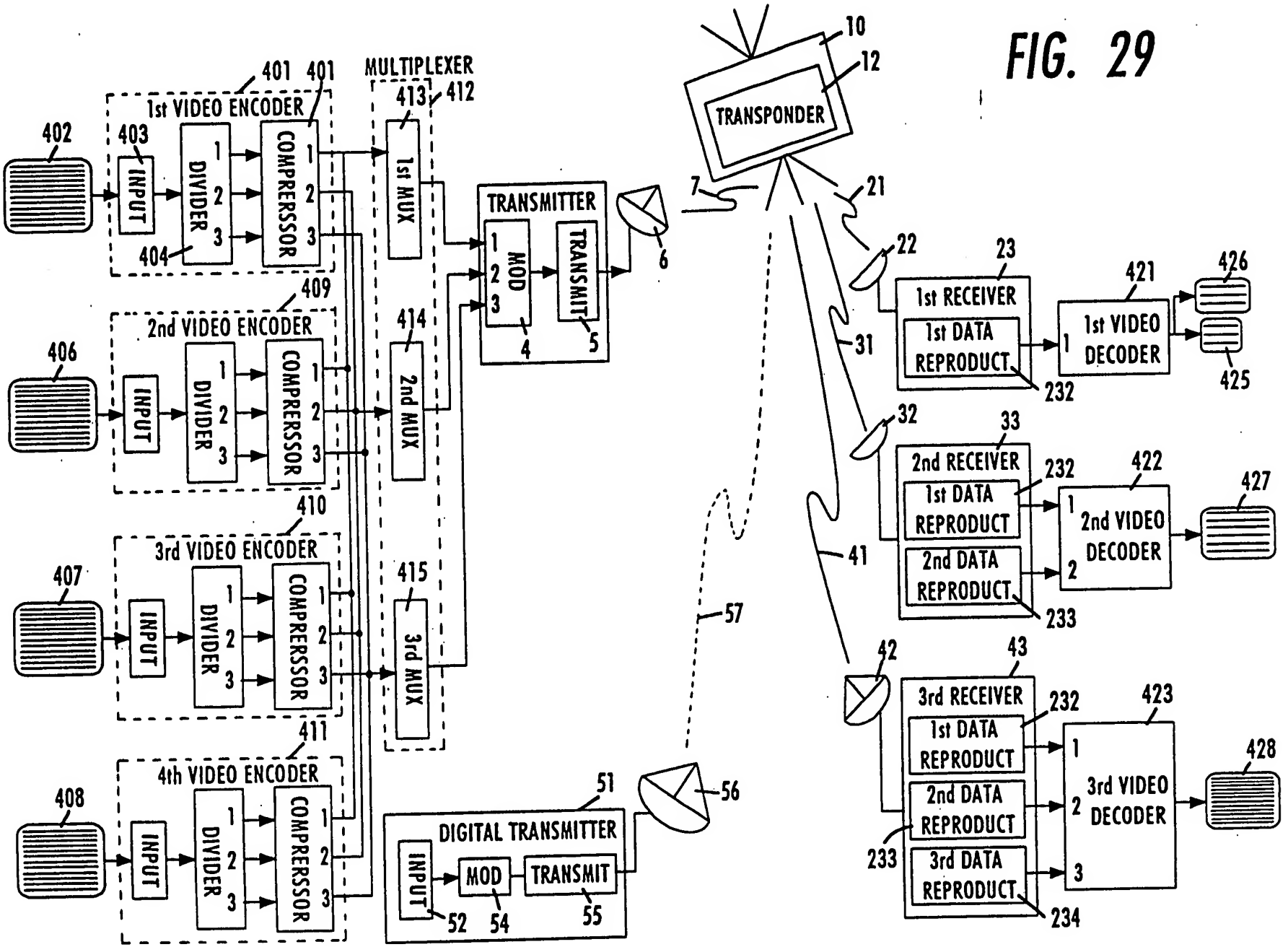

1st VIDEO ENCODER
401
401
403
INPUT
DIVIDER
COMPRERSSOR
404
402
MULTIPLEXER
413
412
1st MUX
TRANSMITTER
MOD
TRANSMIT
4
5
6
2nd VIDEO ENCODER
409
406
414
2nd MUX
3rd VIDEO ENCODER
410
407
415
3rd MUX
4th VIDEO ENCODER
411
408
DIGITAL TRANSMITTER
51
INPUT
MOD
TRANSMIT
52
54
55
56
TRANSPONDER
10
12
7
21
22
23
1st RECEIVER
1st DATA REPRODUCT
232
1st VIDEO DECODER
421
426
425
31
32
33
2nd RECEIVER
232
1st DATA REPRODUCT
2nd DATA REPRODUCT
233
2nd VIDEO DECODER
422
427
41
42
43
3rd RECEIVER
232
1st DATA REPRODUCT
2nd DATA REPRODUCT
3rd DATA REPRODUCT
233
234
3rd VIDEO DECODER
423
428
57

FIG. 29

FIG. 30

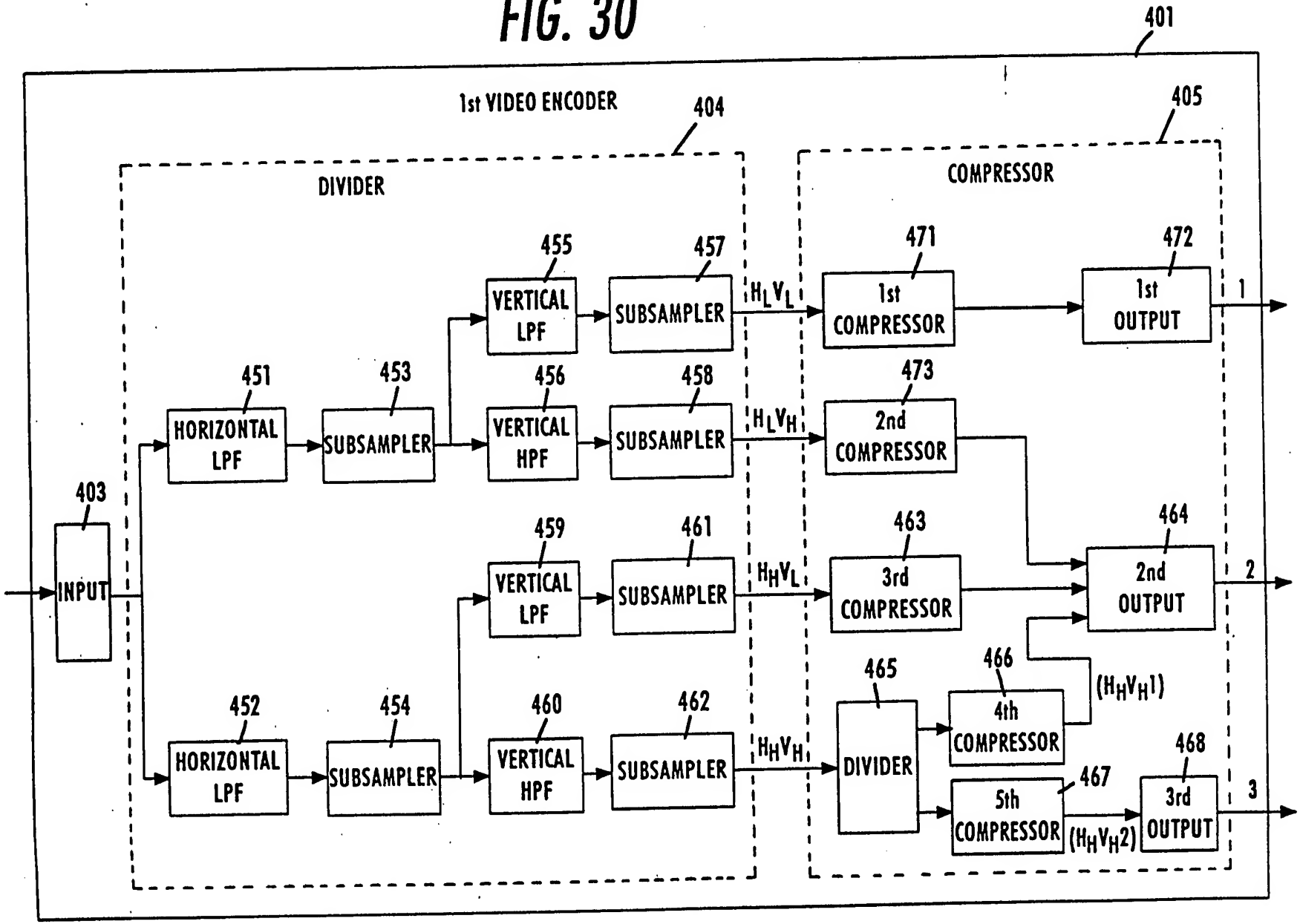

401
1st VIDEO ENCODER
404
405
DIVIDER
COMPRESSOR
403
INPUT
451
HORIZONTAL LPF
453
SUBSAMPLER
455
VERTICAL LPF
457
SUBSAMPLER
456
VERTICAL HPF
458
SUBSAMPLER
459
VERTICAL LPF
461
SUBSAMPLER
452
HORIZONTAL LPF
454
SUBSAMPLER
460
VERTICAL HPF
462
SUBSAMPLER
H_LV_L
H_LV_H
H_HV_L
H_HV_H
471
1st COMPRESSOR
473
2nd COMPRESSOR
463
3rd COMPRESSOR
465
DIVIDER
466
4th COMPRESSOR
467
5th COMPRESSOR
472
1st OUTPUT
464
2nd OUTPUT
468
3rd OUTPUT
1
2
3
(H_HV_H1)
(H_HV_H2)

FIG. 31

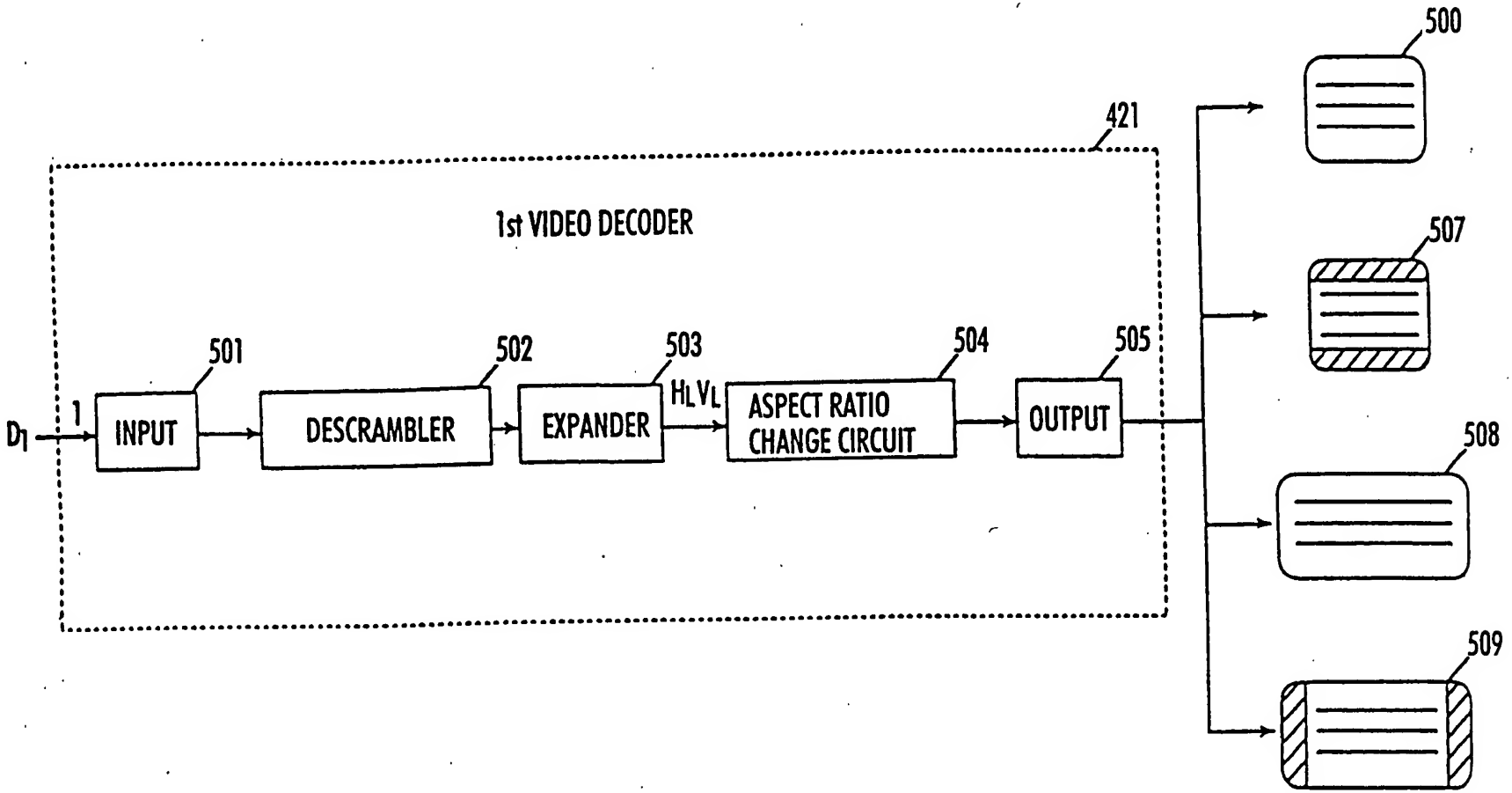

421
1st VIDEO DECODER
D_1
1
INPUT
501
DESCRAMBLER
502
EXPANDER
503
$H_L V_L$
ASPECT RATIO CHANGE CIRCUIT
504
OUTPUT
505
500
507
508
509

FIG. 32

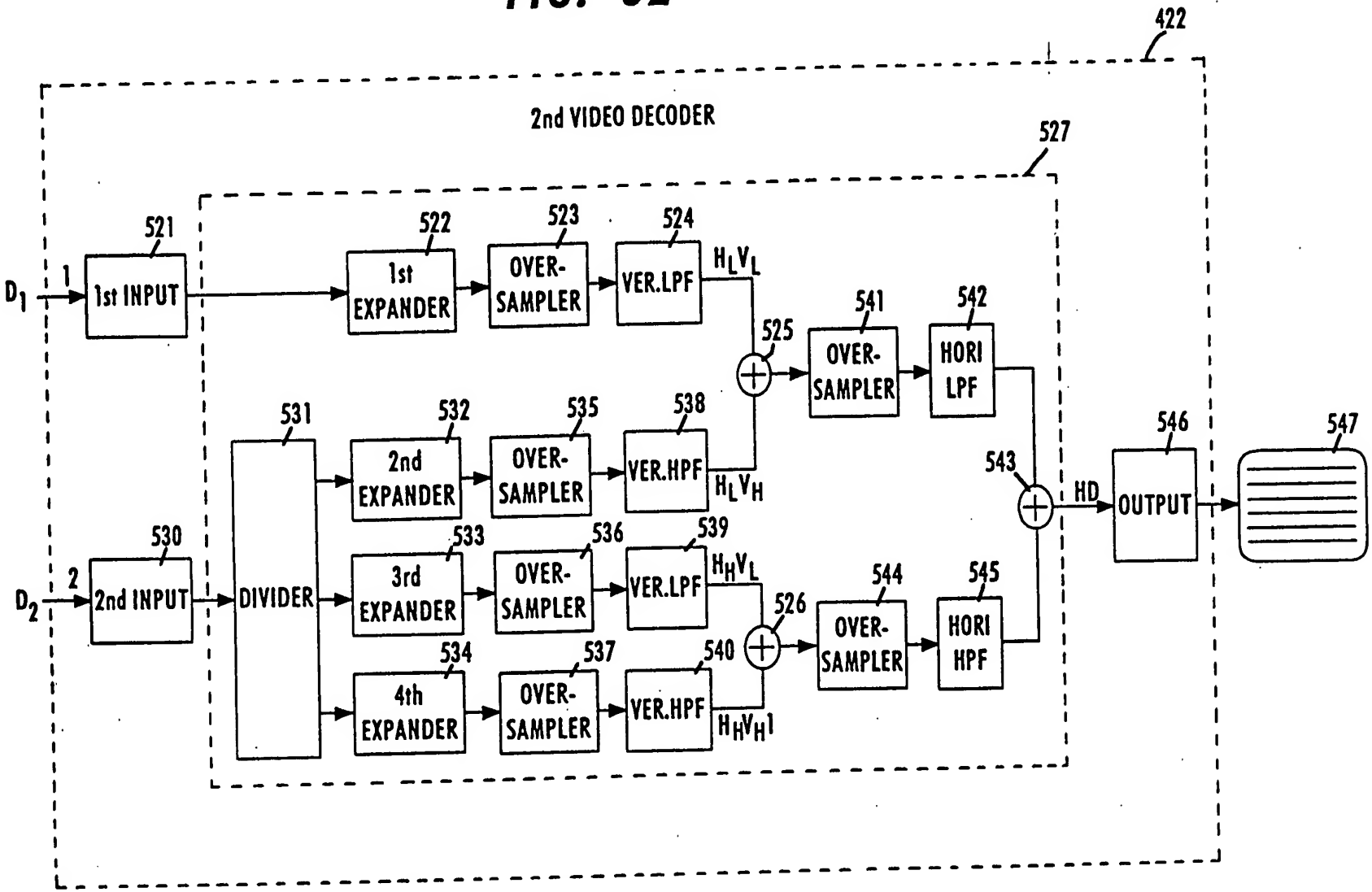

422
2nd VIDEO DECODER
527
521
522
523
524
1
D1
1st INPUT
1st EXPANDER
OVER-SAMPLER
VER.LPF
HLVL
525
541
542
OVER-SAMPLER
HORI LPF
531
532
535
538
2nd EXPANDER
OVER-SAMPLER
VER.HPF
HLVH
543
546
547
530
533
536
539
2
D2
2nd INPUT
DIVIDER
3rd EXPANDER
OVER-SAMPLER
VER.LPF
HHVL
526
544
545
HD
OUTPUT
534
537
540
4th EXPANDER
OVER-SAMPLER
VER.HPF
HHVH1
OVER-SAMPLER
HORI HPF

FIG. 33

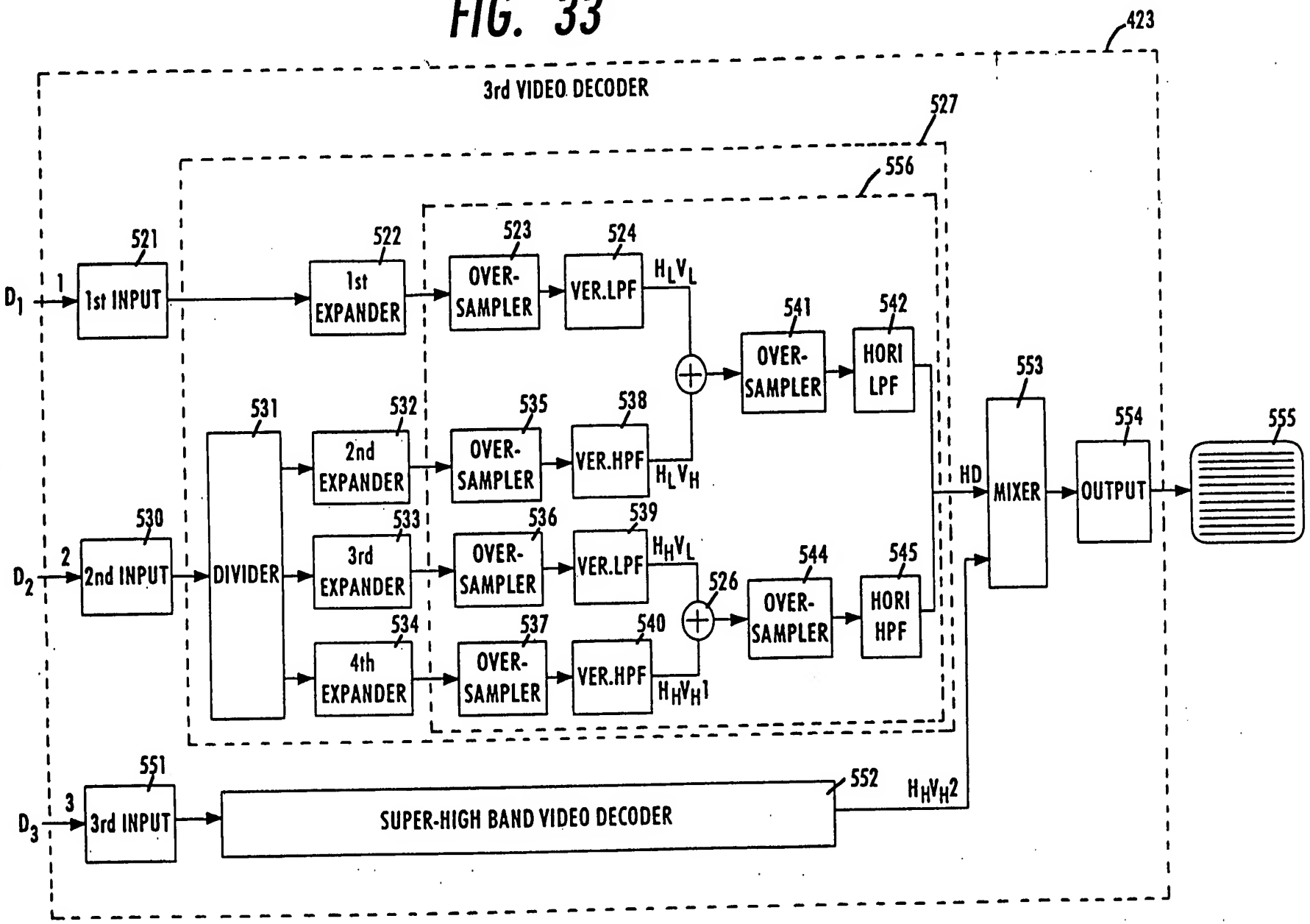

423
3rd VIDEO DECODER
527
556
521
522
523
524
H_LV_L
D_1
1
1st INPUT
1st EXPANDER
OVER-SAMPLER
VER.LPF
541
542
OVER-SAMPLER
HORI LPF
553
554
555
531
532
535
538
2nd EXPANDER
OVER-SAMPLER
VER.HPF
H_LV_H
HD
MIXER
OUTPUT
530
533
536
539
H_HV_L
526
544
545
D_2
2
2nd INPUT
DIVIDER
3rd EXPANDER
OVER-SAMPLER
VER.LPF
OVER-SAMPLER
HORI HPF
534
537
540
H_HV_H1
4th EXPANDER
OVER-SAMPLER
VER.HPF
551
552
H_HV_H2
D_3
3
3rd INPUT
SUPER-HIGH BAND VIDEO DECODER

FIG. 34

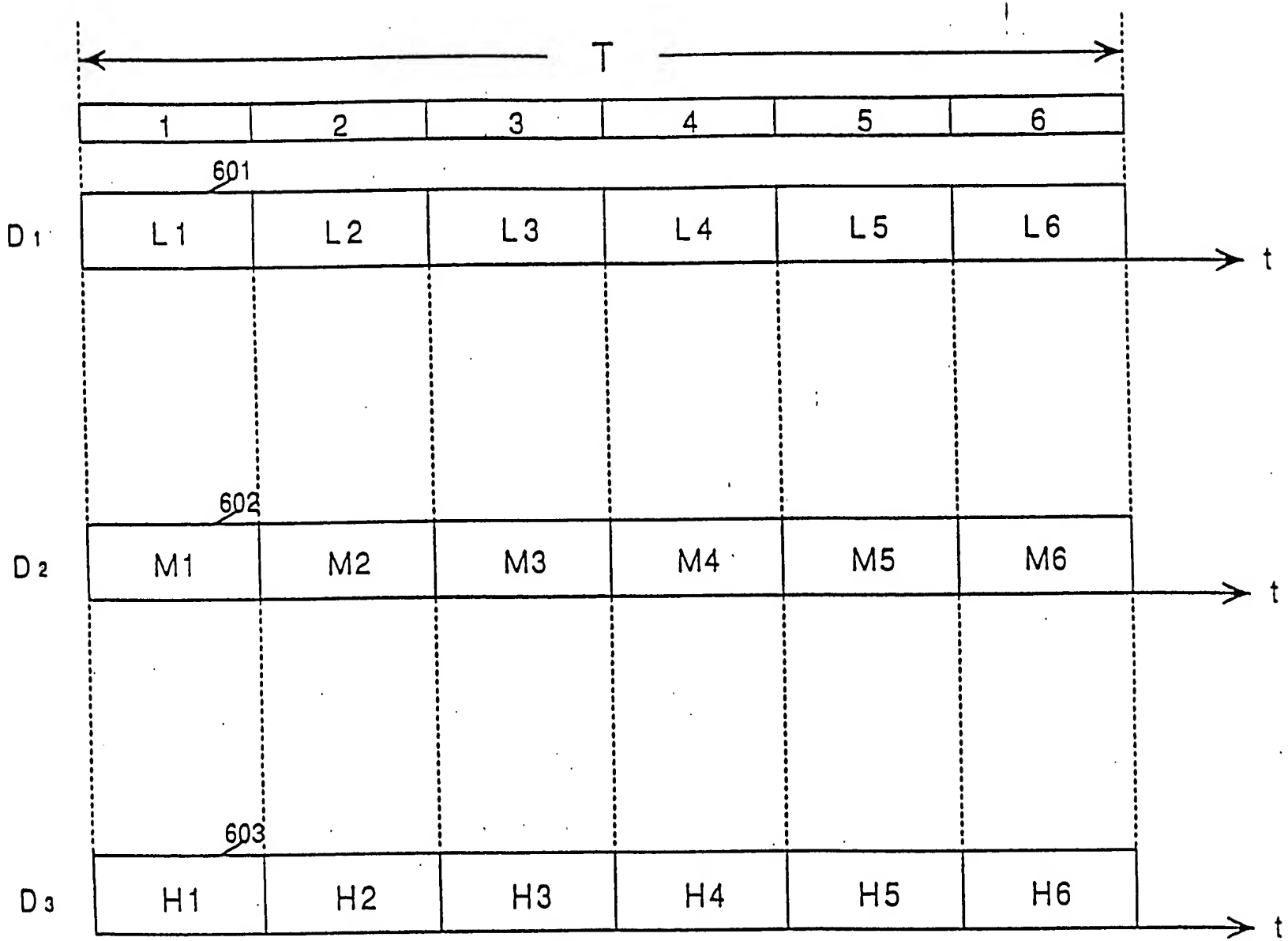

T
1
2
3
4
5
6
601
D1
L1
L2
L3
L4
L5
L6
t
602
D2
M1
M2
M3
M4
M5
M6
t
603
D3
H1
H2
H3
H4
H5
H6
t

FIG. 35

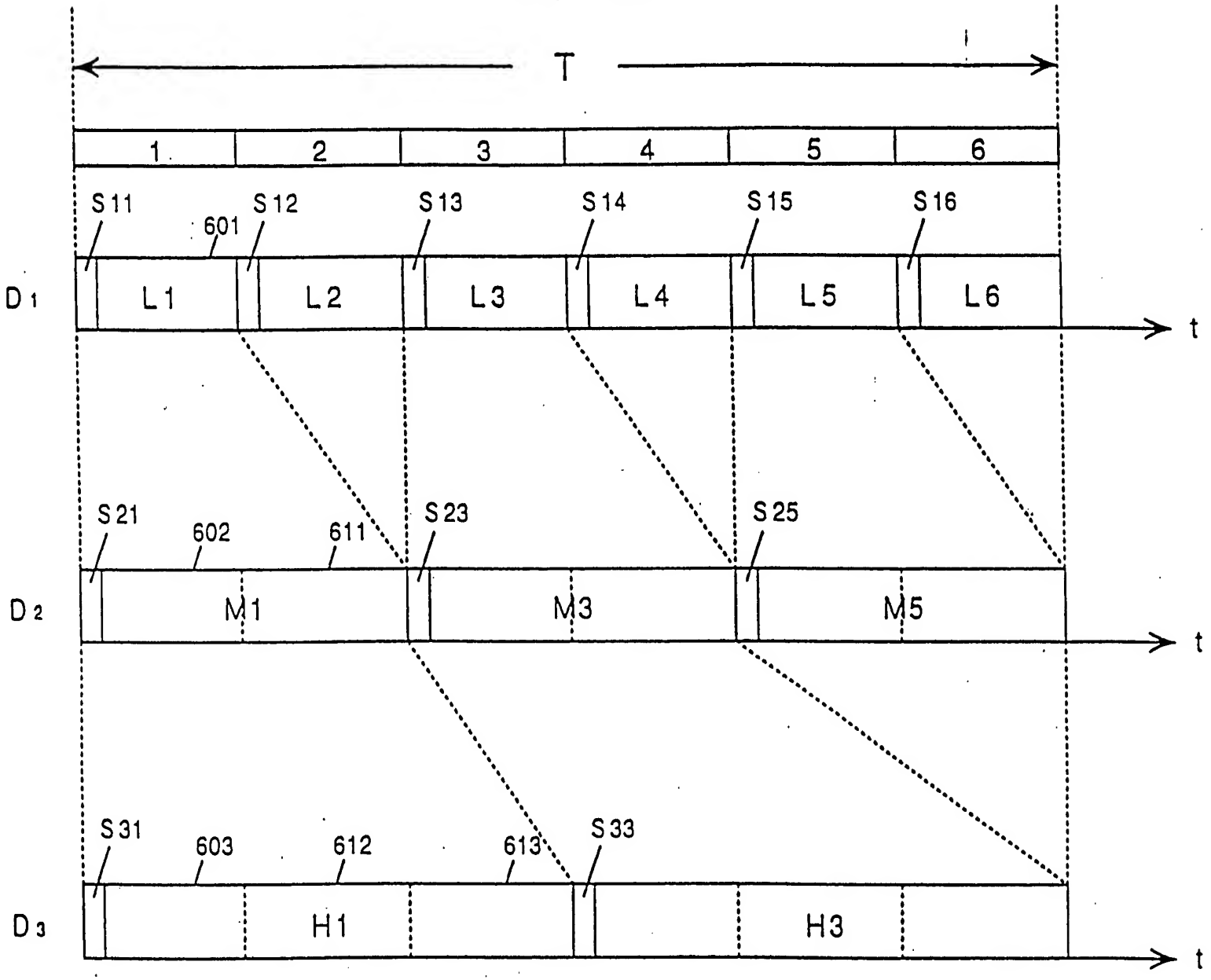

T
1
2
3
4
5
6
S11
S12
S13
S14
S15
S16
601
D1
L1
L2
L3
L4
L5
L6
t
S21
602
611
S23
S25
D2
M1
M3
M5
t
S31
603
612
613
S33
D3
H1
H3
t

FIG. 36

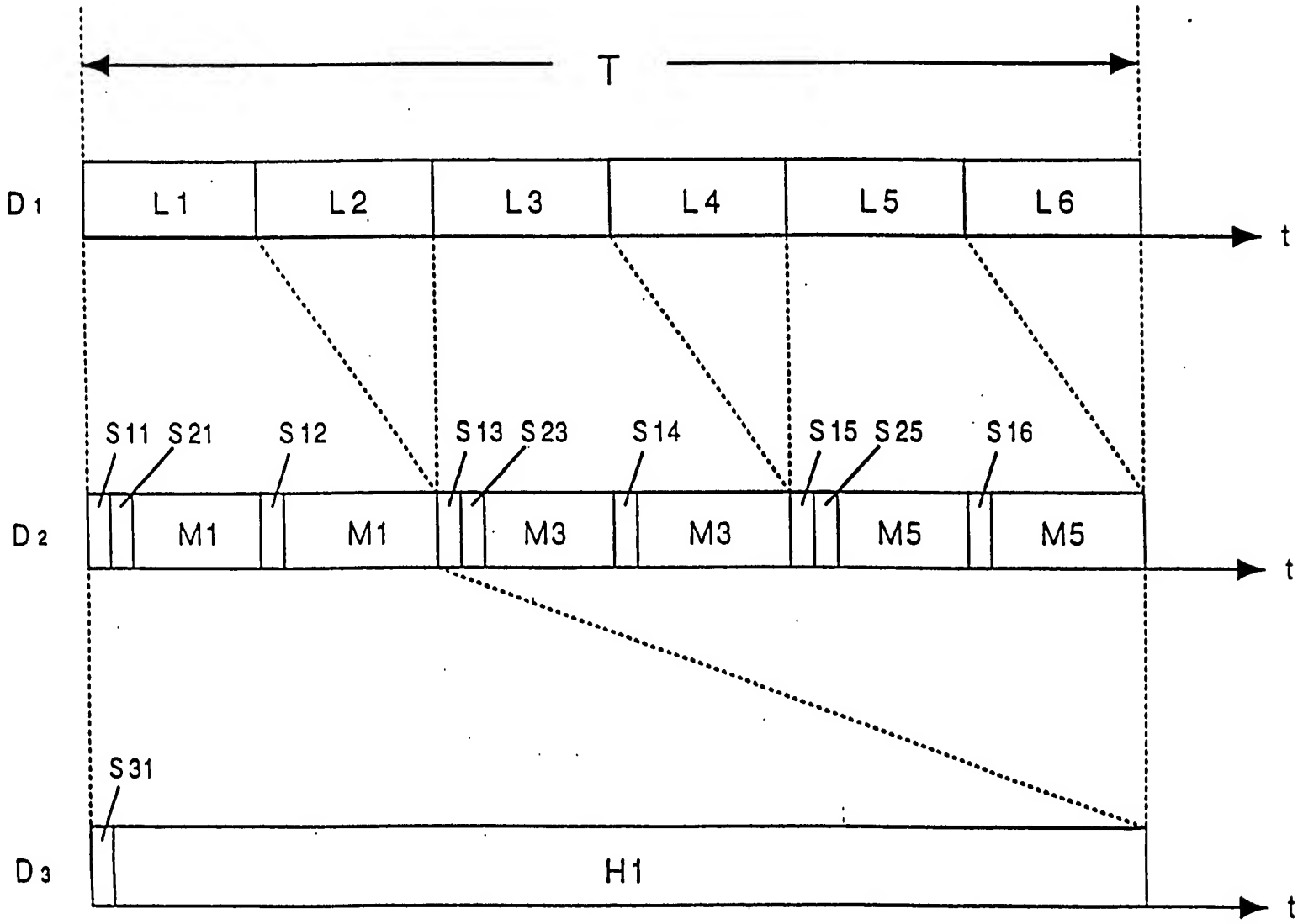

T
D1
L1
L2
L3
L4
L5
L6
t
S11 S21
S12
S13 S23
S14
S15 S25
S16
D2
M1
M1
M3
M3
M5
M5
t
S31
D3
H1
t

FIG. 37

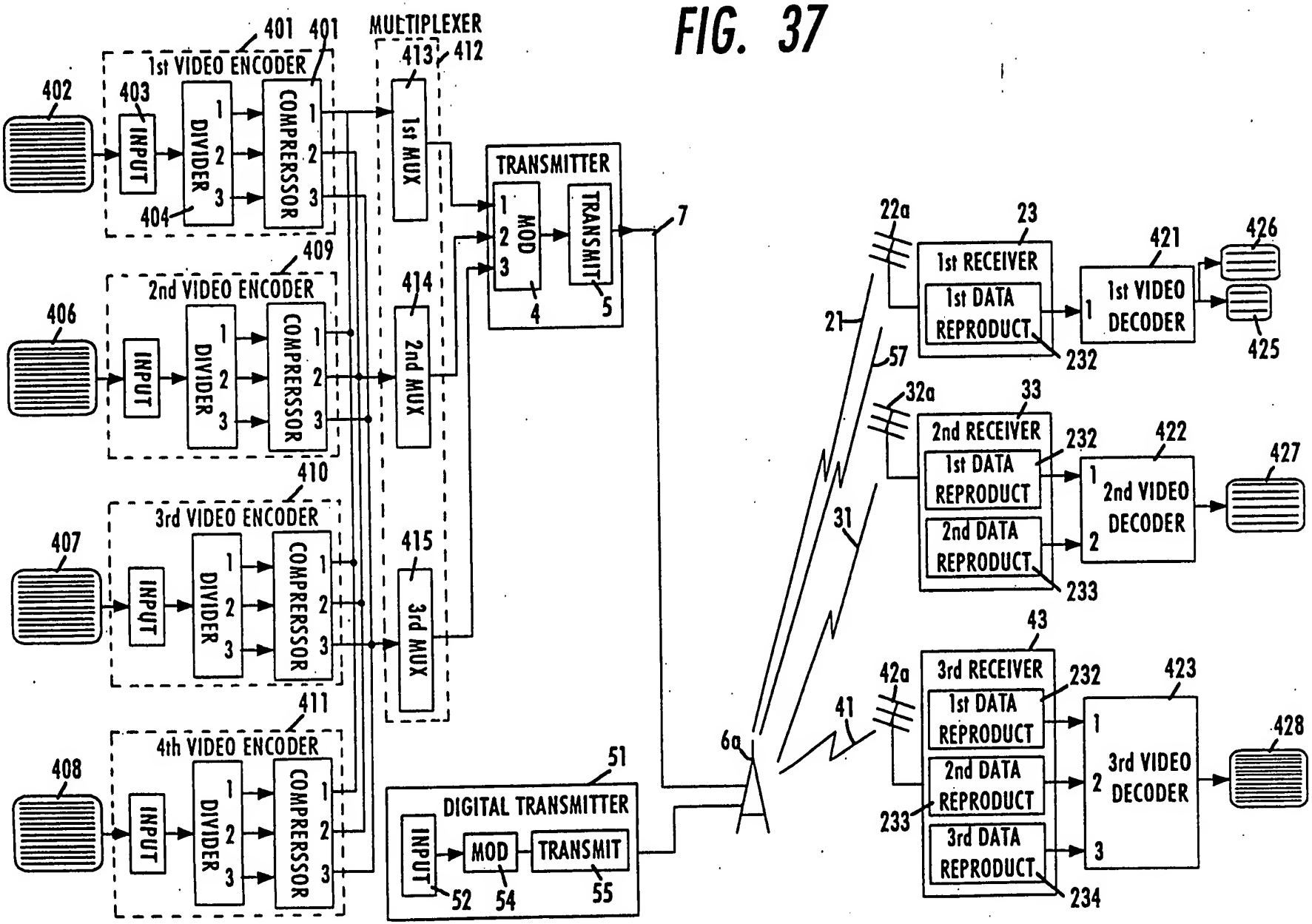

401
401
MULTIPLEXER
1st VIDEO ENCODER
413
412
402
403
INPUT
DIVIDER
1
2
3
COMPRERSSOR
1
2
3
404
1st MUX
TRANSMITTER
1
2
3
MOD
4
TRANSMIT
5
7
409
2nd VIDEO ENCODER
414
406
2nd MUX
410
3rd VIDEO ENCODER
407
415
3rd MUX
411
4th VIDEO ENCODER
408
51
DIGITAL TRANSMITTER
52
54
55
6a
22a
23
1st RECEIVER
1st DATA REPRODUCT
232
421
1st VIDEO DECODER
426
425
21
57
32a
33
2nd RECEIVER
1st DATA REPRODUCT
2nd DATA REPRODUCT
232
233
422
2nd VIDEO DECODER
427
31
43
42a
41
3rd RECEIVER
1st DATA REPRODUCT
2nd DATA REPRODUCT
3rd DATA REPRODUCT
232
233
234
423
3rd VIDEO DECODER
428

FIG. 38

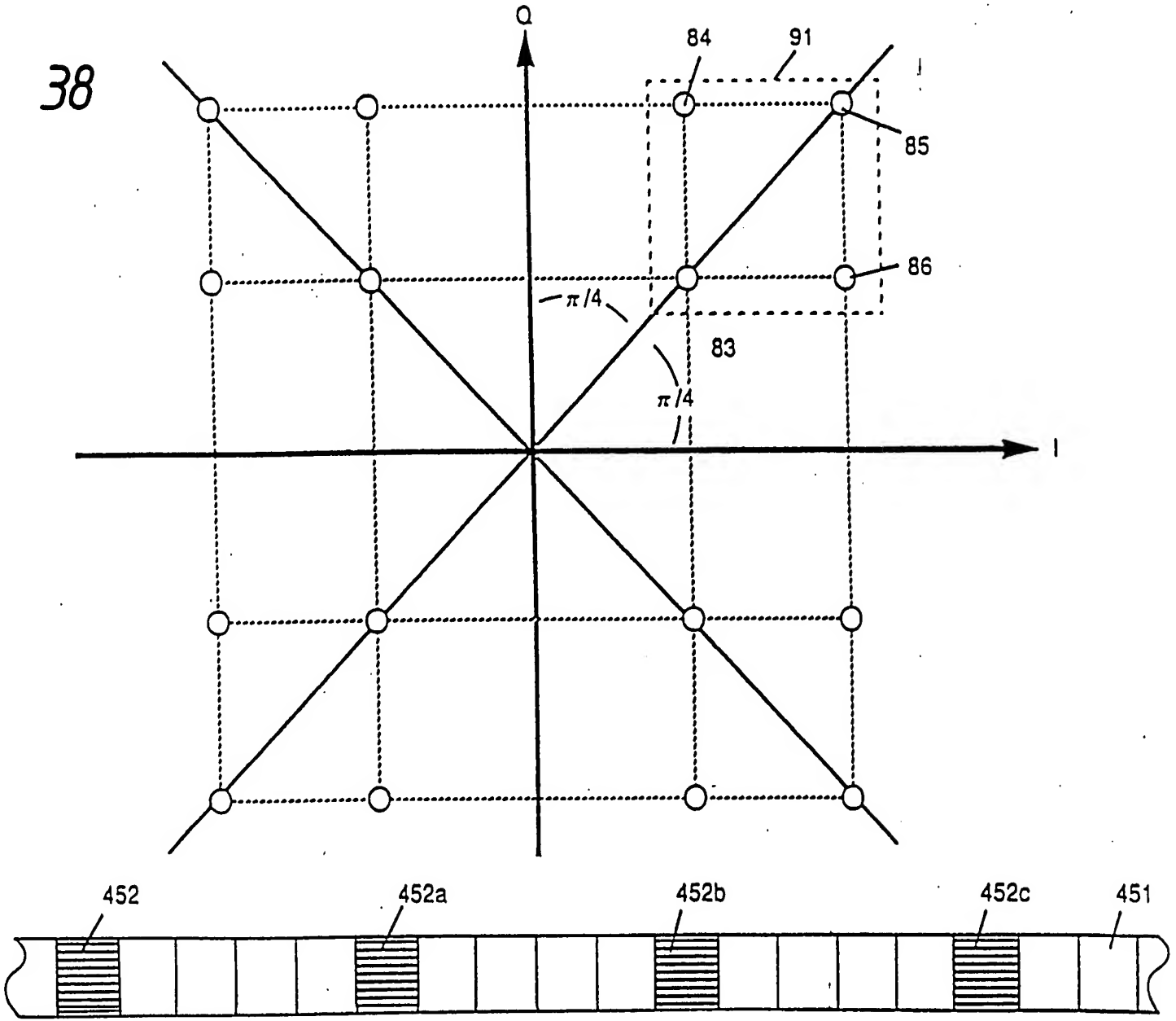


FIG. 39

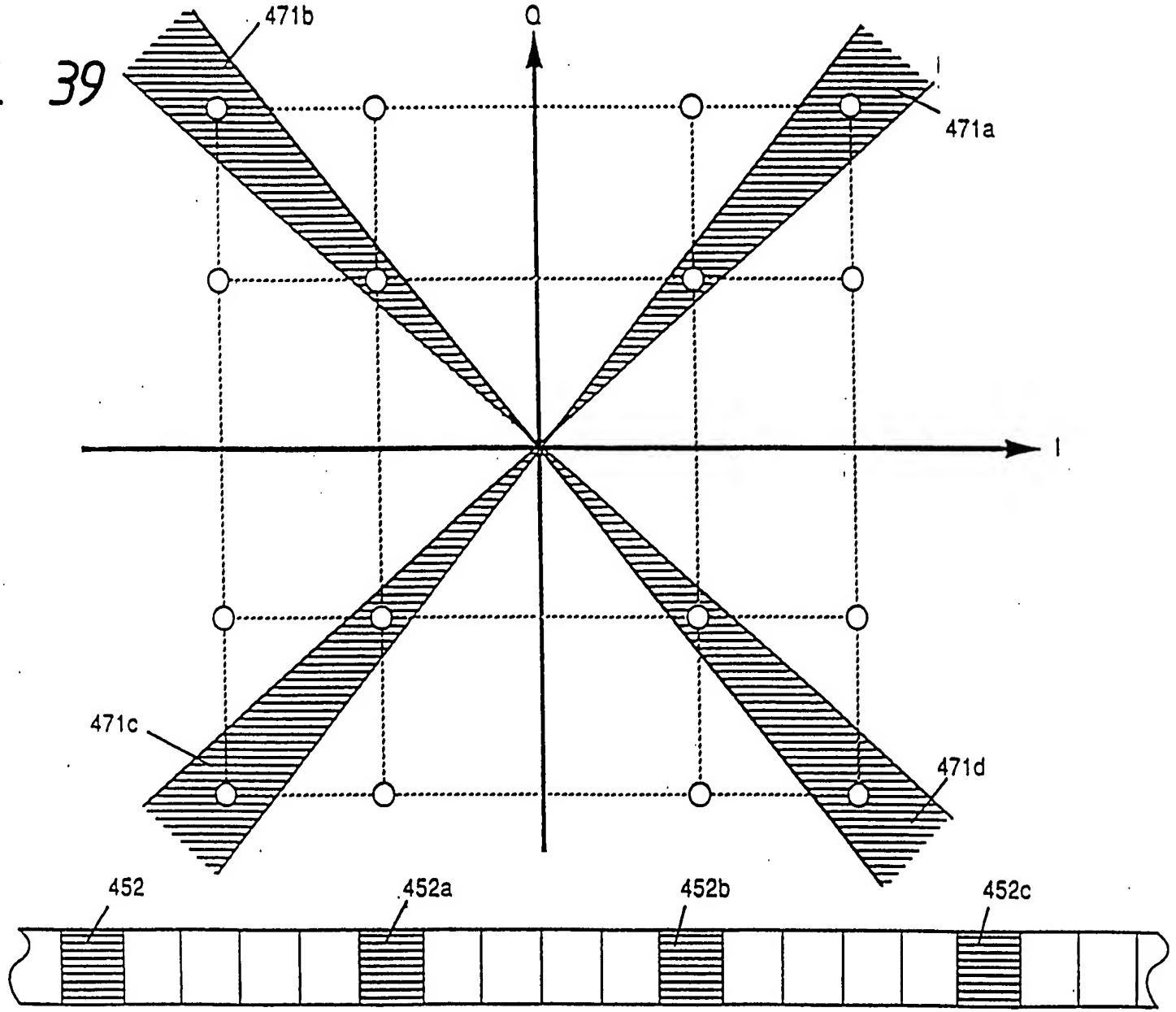


FIG. 40

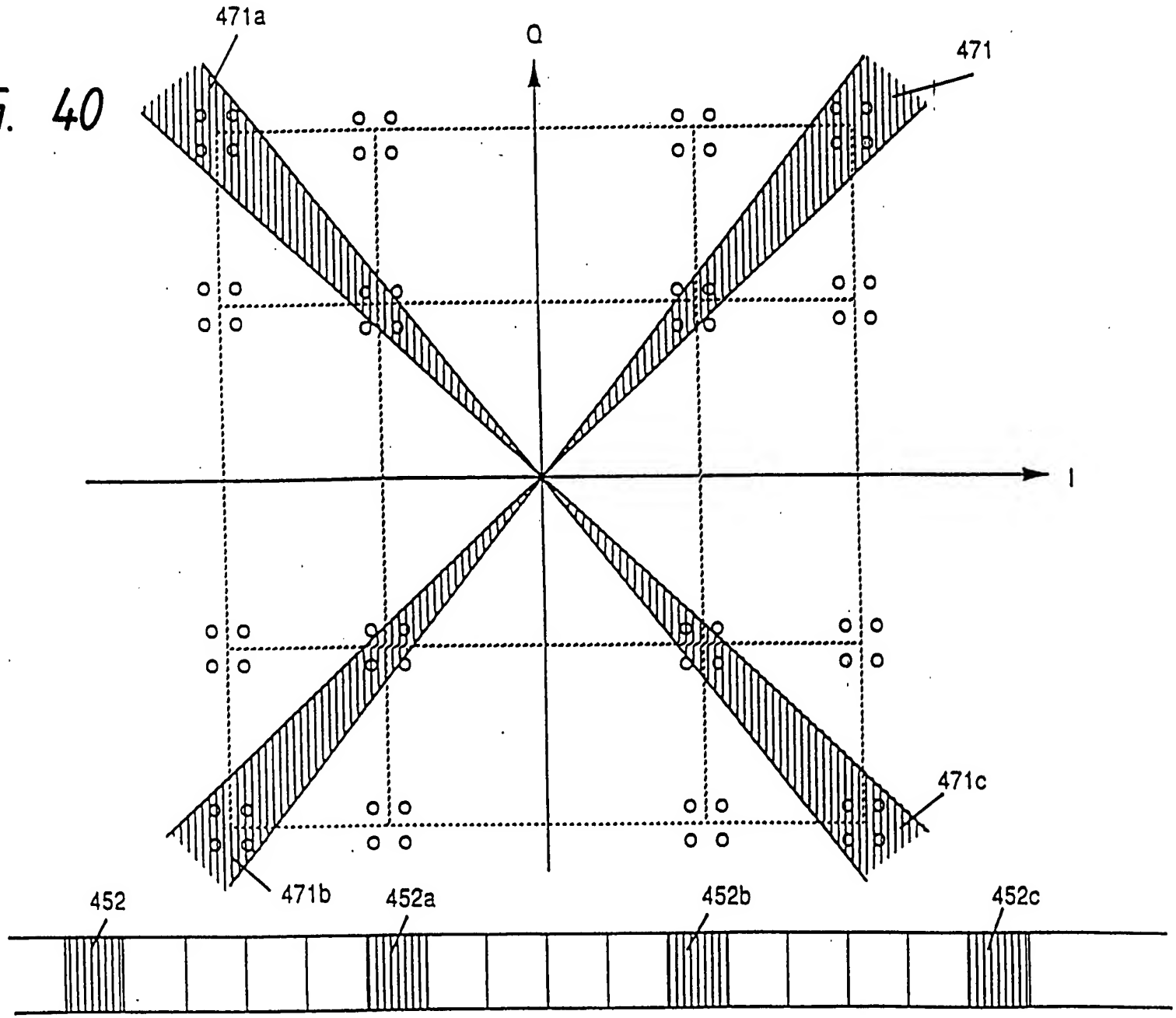


FIG. 41

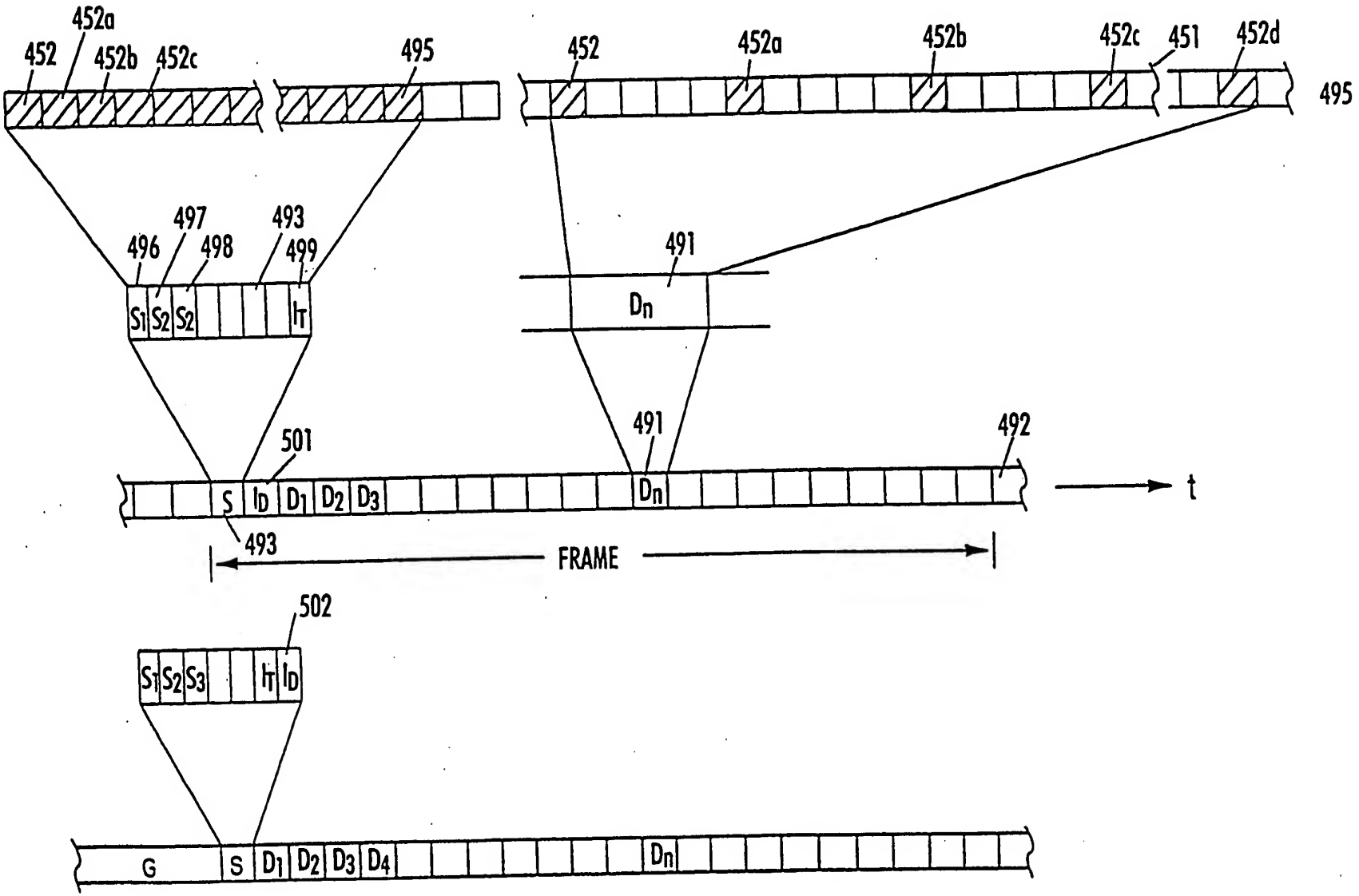

452a
452
452b
452c
495
452
452a
452b
452c
451
452d
495
497
493
496
498
499
491
S1 S2 S2 IT
Dn
501
491
492
S ID D1 D2 D3
Dn
t
493
FRAME
502
S1 S2 S3 IT ID
G
S
D1 D2 D3 D4
Dn

FIG. 42

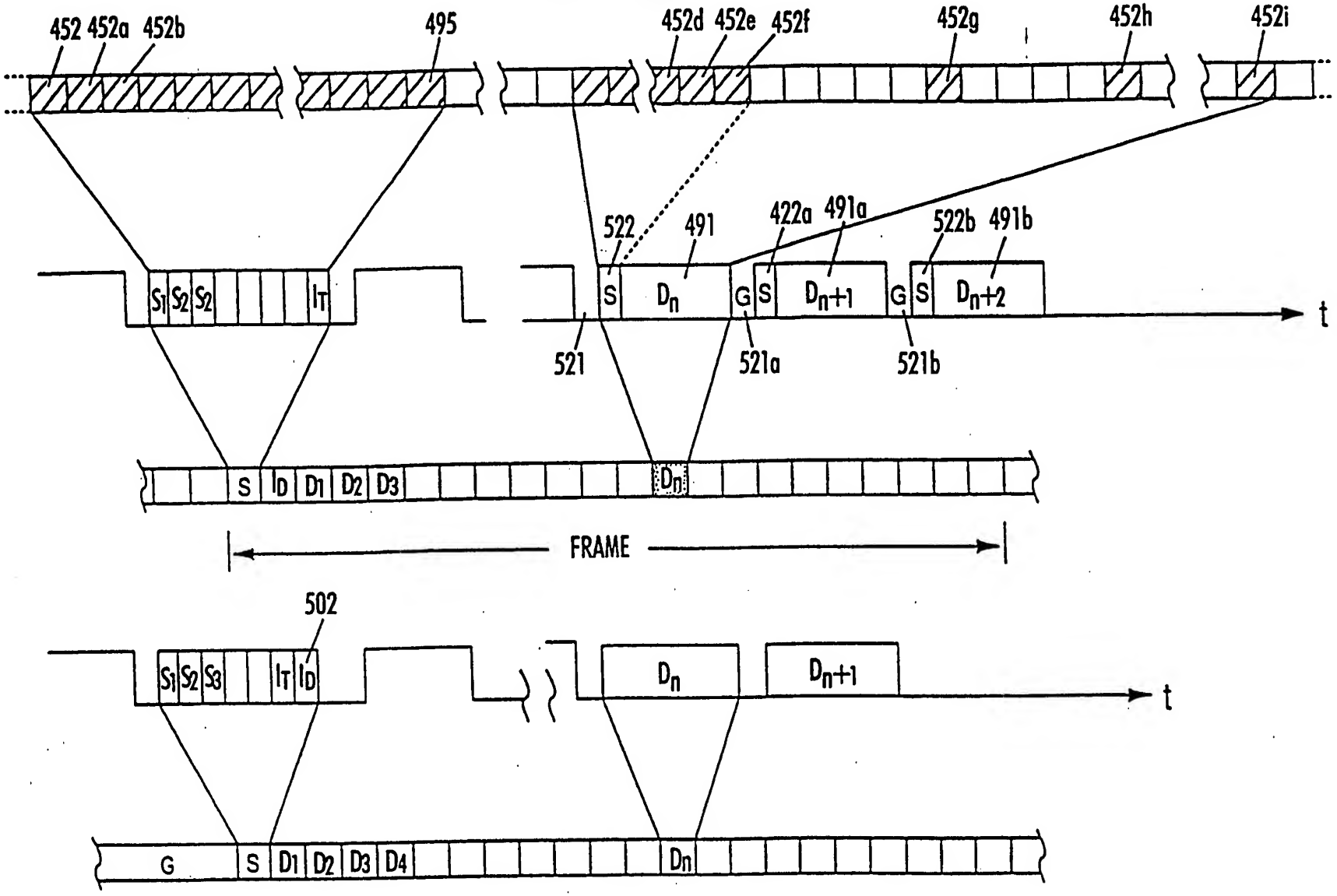

452
452a
452b
495
452d
452e
452f
452g
452h
452i
522
491
422a
491a
522b
491b
S1 S2 S2
IT
S
Dn
G
S
Dn+1
G
S
Dn+2
t
521
521a
521b
S
ID
D1
D2
D3
Dn
FRAME
502
S1 S2 S3
IT
ID
Dn
Dn+1
t
G
S
D1
D2
D3
D4
Dn

FIG. 43

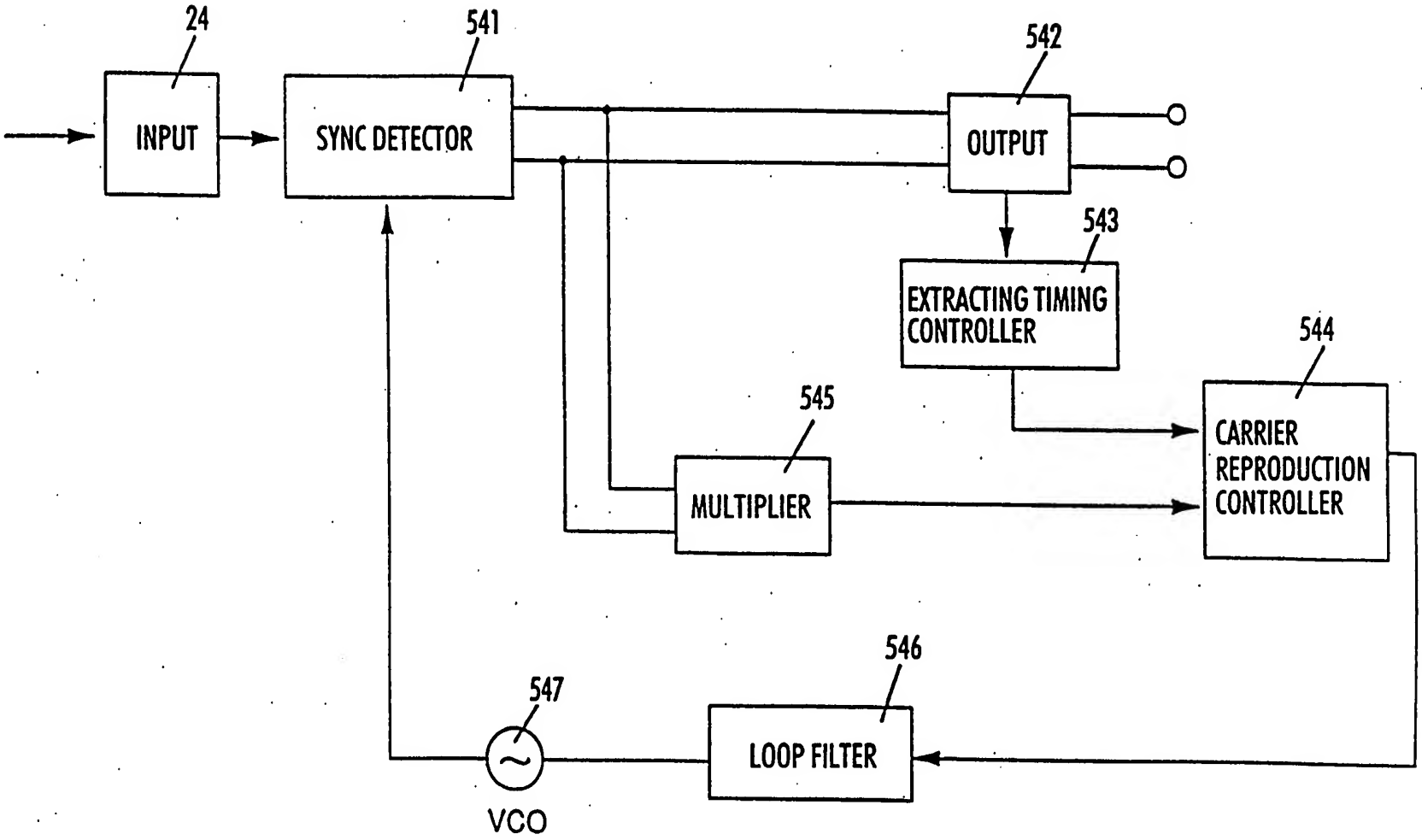

24
INPUT
541
SYNC DETECTOR
542
OUTPUT
543
EXTRACTING TIMING CONTROLLER
544
CARRIER REPRODUCTION CONTROLLER
545
MULTIPLIER
546
LOOP FILTER
547
VCO

FIG. 44

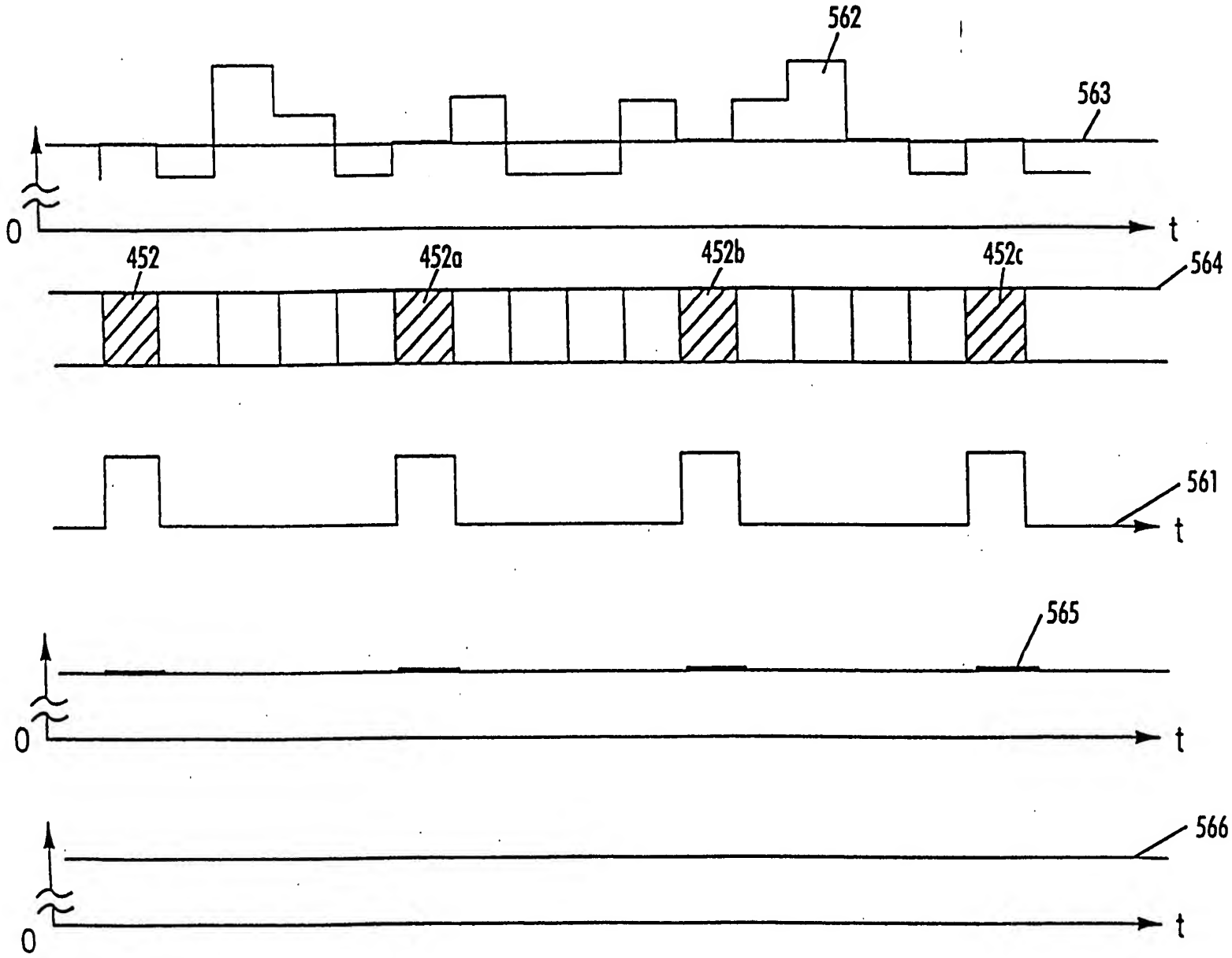


FIG. 45

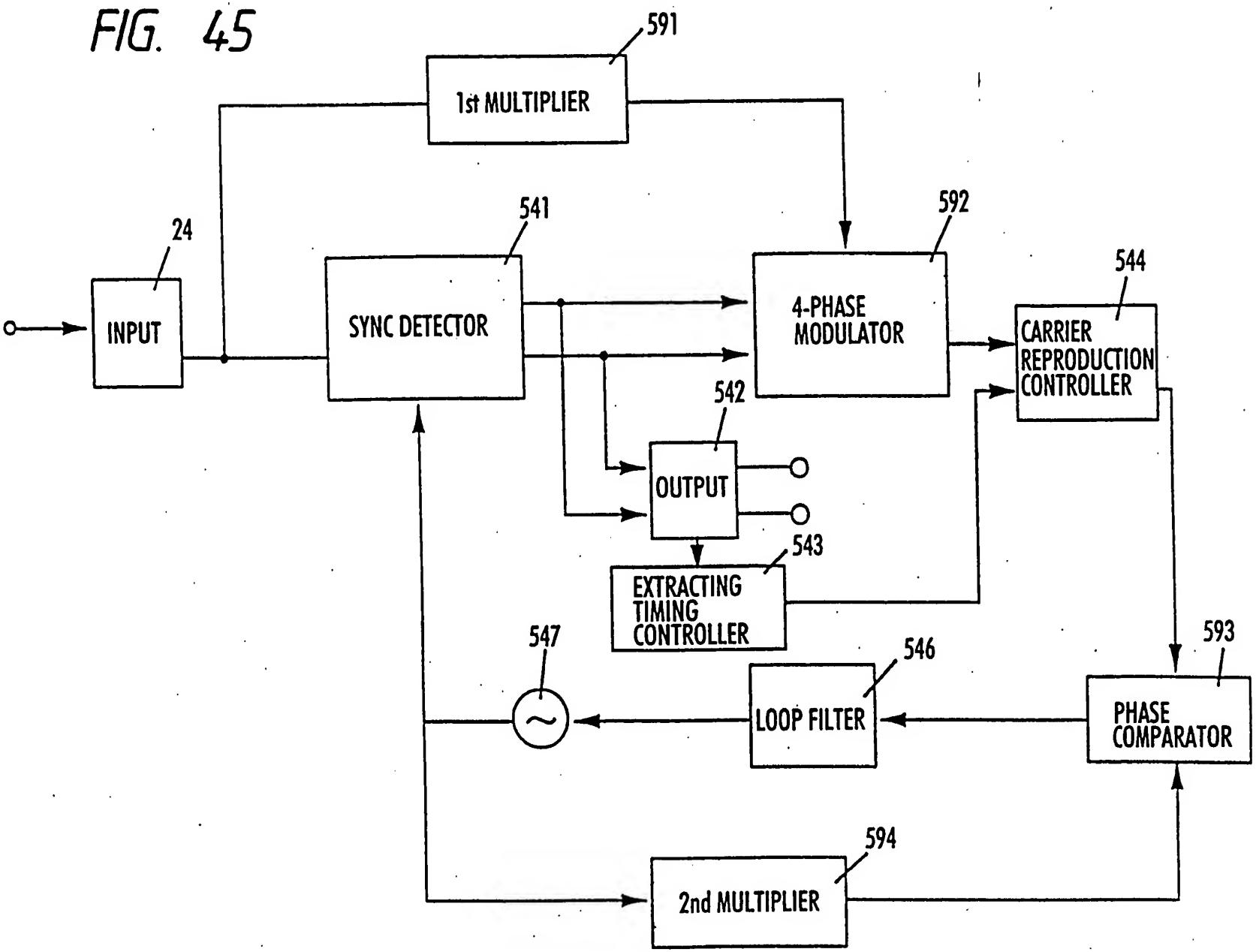

591
1st MULTIPLIER
24
INPUT
541
SYNC DETECTOR
592
4-PHASE MODULATOR
544
CARRIER REPRODUCTION CONTROLLER
542
OUTPUT
543
EXTRACTING TIMING CONTROLLER
547
546
LOOP FILTER
593
PHASE COMPARATOR
594
2nd MULTIPLIER

FIG. 46

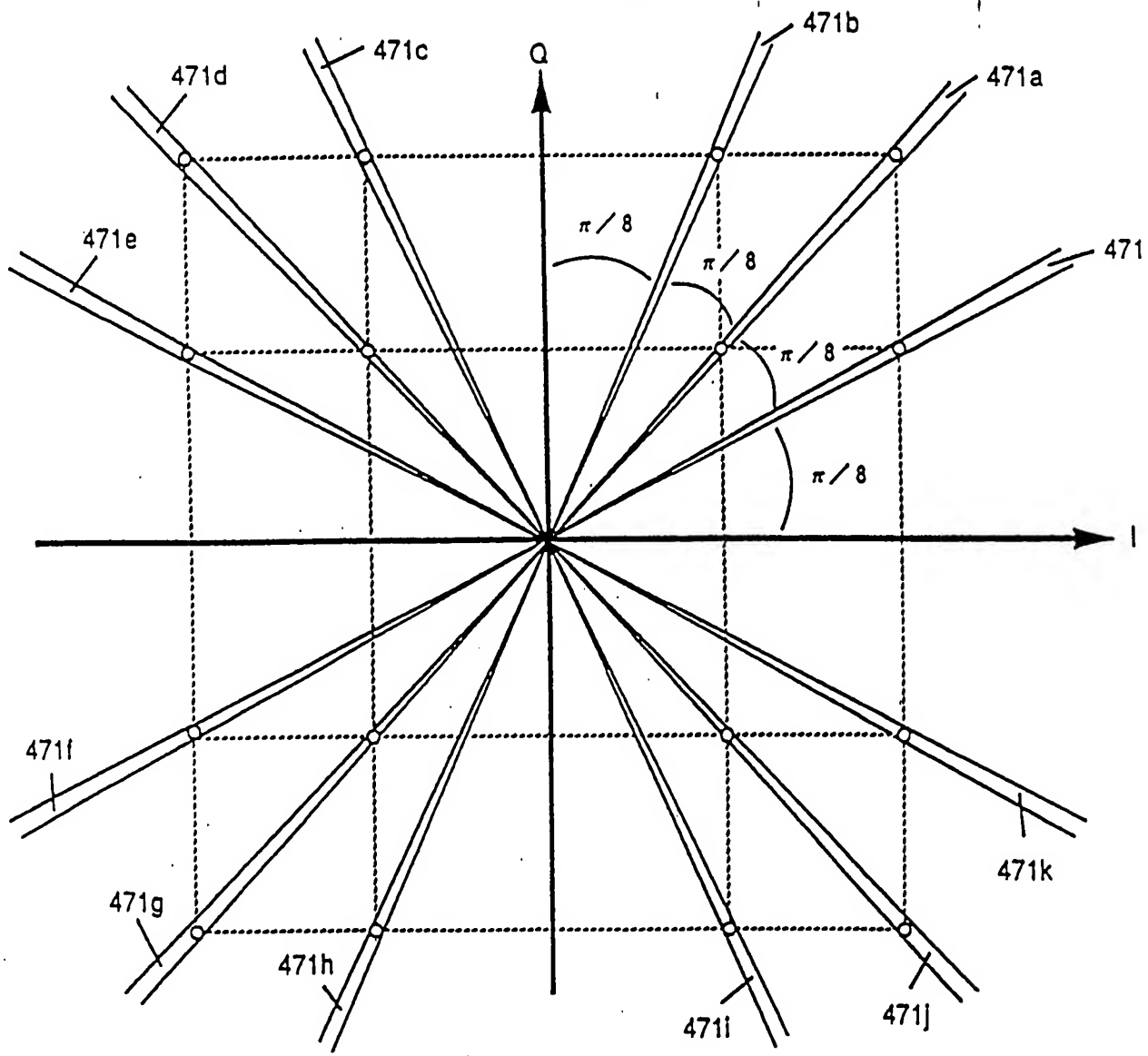

471b
471c
Q
471d
471a
471e
π / 8
π / 8
471
π / 8
π / 8
I
471f
471k
471g
471h
471i
471j

FIG. 47

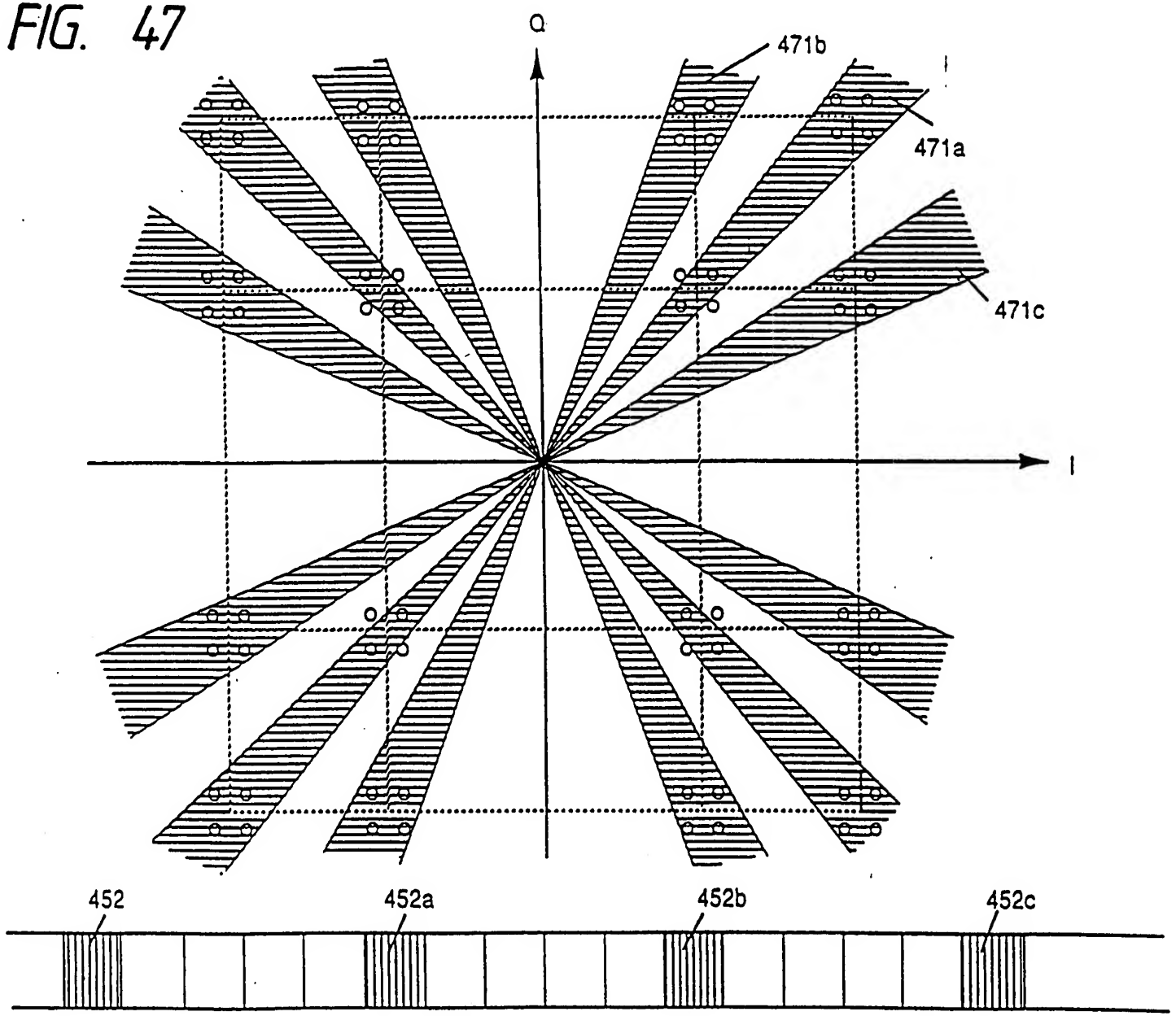


FIG. 48

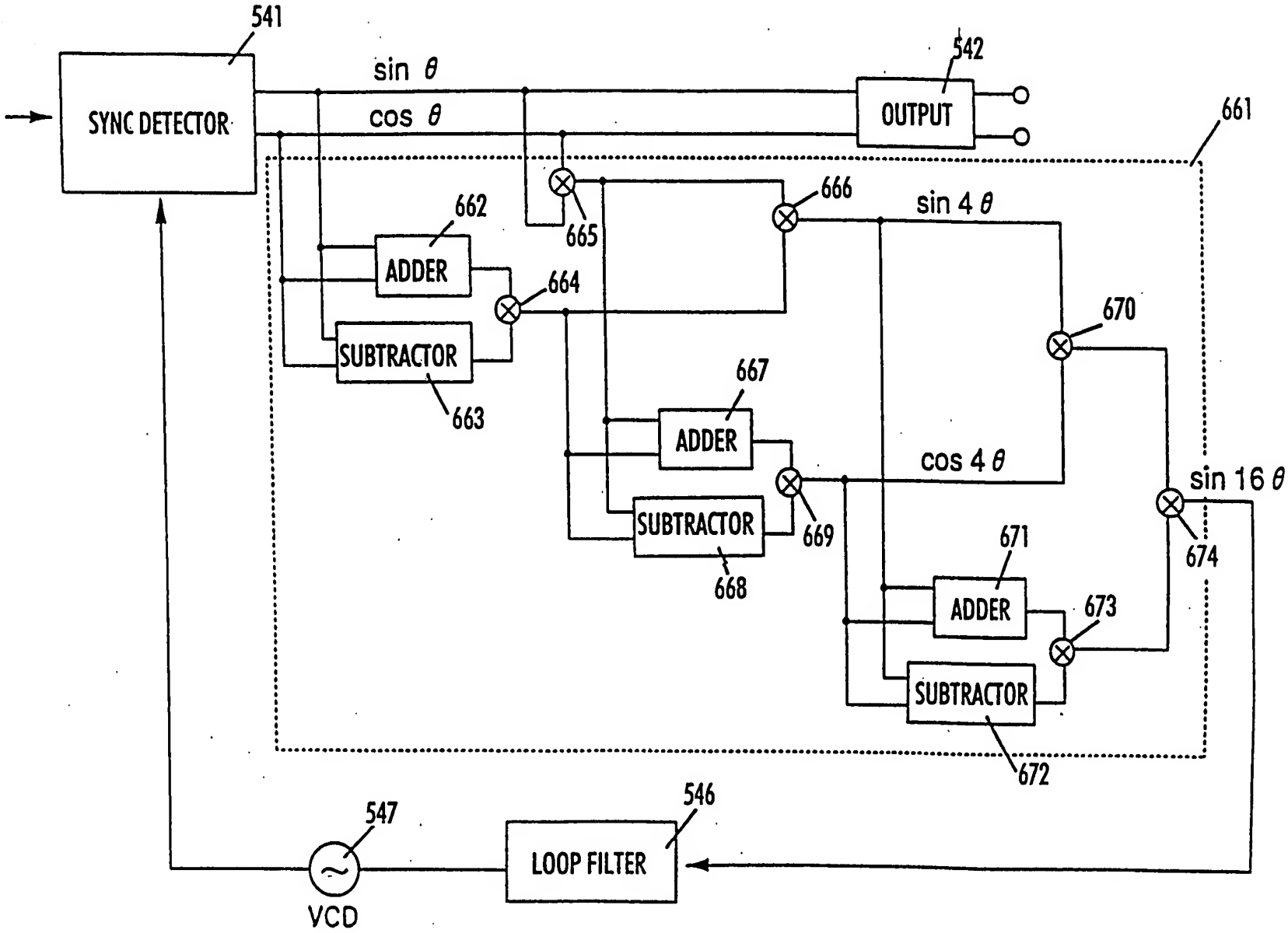

541
SYNC DETECTOR
sin θ
cos θ
542
OUTPUT
661
662
ADDER
665
666
sin 4 θ
664
SUBTRACTOR
663
670
667
ADDER
cos 4 θ
sin 16 θ
669
SUBTRACTOR
668
671
ADDER
673
674
SUBTRACTOR
672
547
546
LOOP FILTER
VCD

FIG. 49

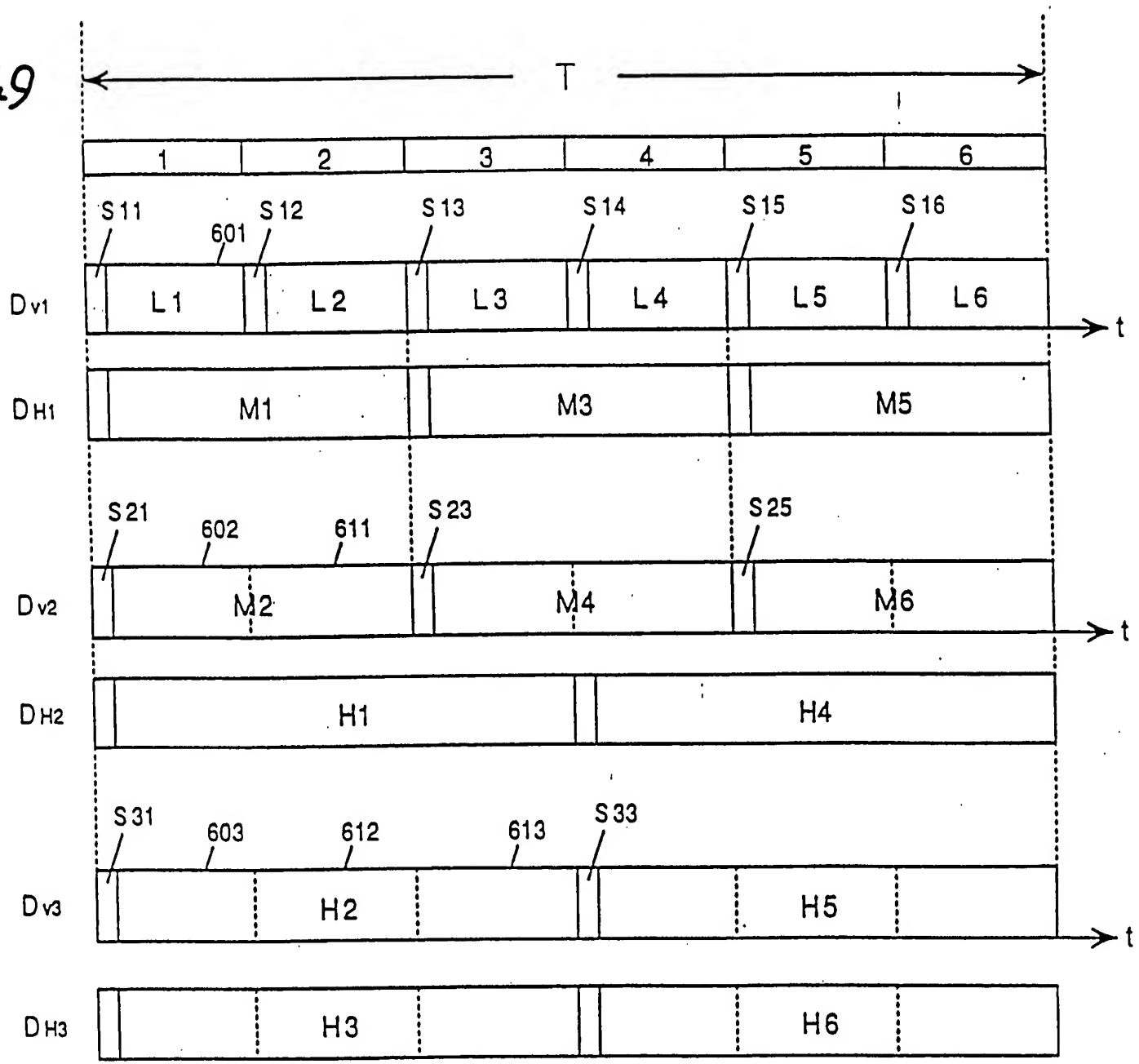

T
1
2
3
4
5
6
S11
S12
S13
S14
S15
S16
601
Dv1
L1
L2
L3
L4
L5
L6
t
DH1
M1
M3
M5
S21
S23
S25
602
611
Dv2
M2
M4
M6
t
DH2
H1
H4
S31
S33
603
612
613
Dv3
H2
H5
t
DH3
H3
H6

FIG. 50

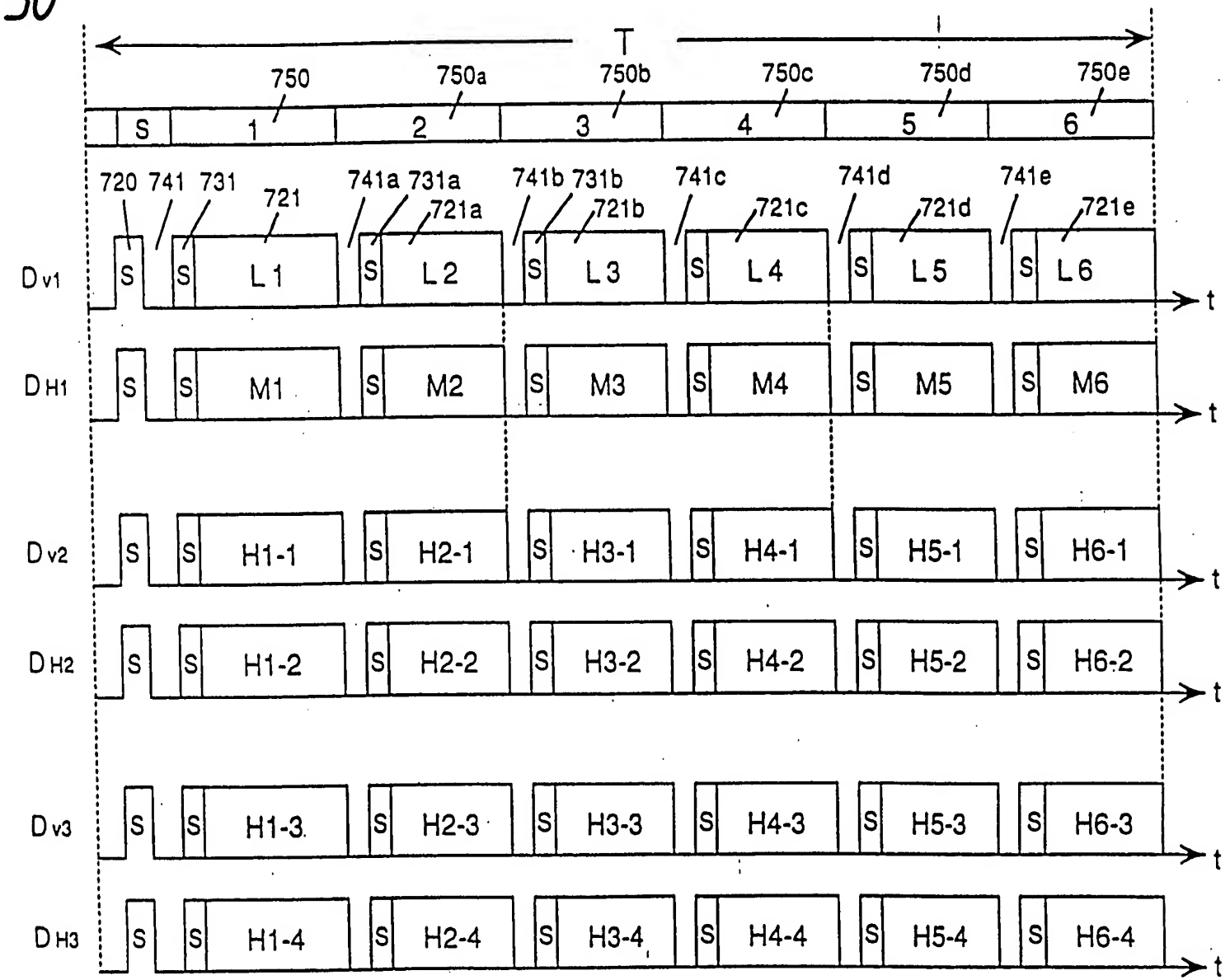

T
750
750a
750b
750c
750d
750e
S
1
2
3
4
5
6
720
741
731
721
741a
731a
721a
741b
731b
721b
741c
721c
741d
721d
741e
721e
Dv1
L1
L2
L3
L4
L5
L6
DH1
M1
M2
M3
M4
M5
M6
Dv2
H1-1
H2-1
H3-1
H4-1
H5-1
H6-1
DH2
H1-2
H2-2
H3-2
H4-2
H5-2
H6-2
Dv3
H1-3
H2-3
H3-3
H4-3
H5-3
H6-3
DH3
H1-4
H2-4
H3-4
H4-4
H5-4
H6-4
t

FIG. 51

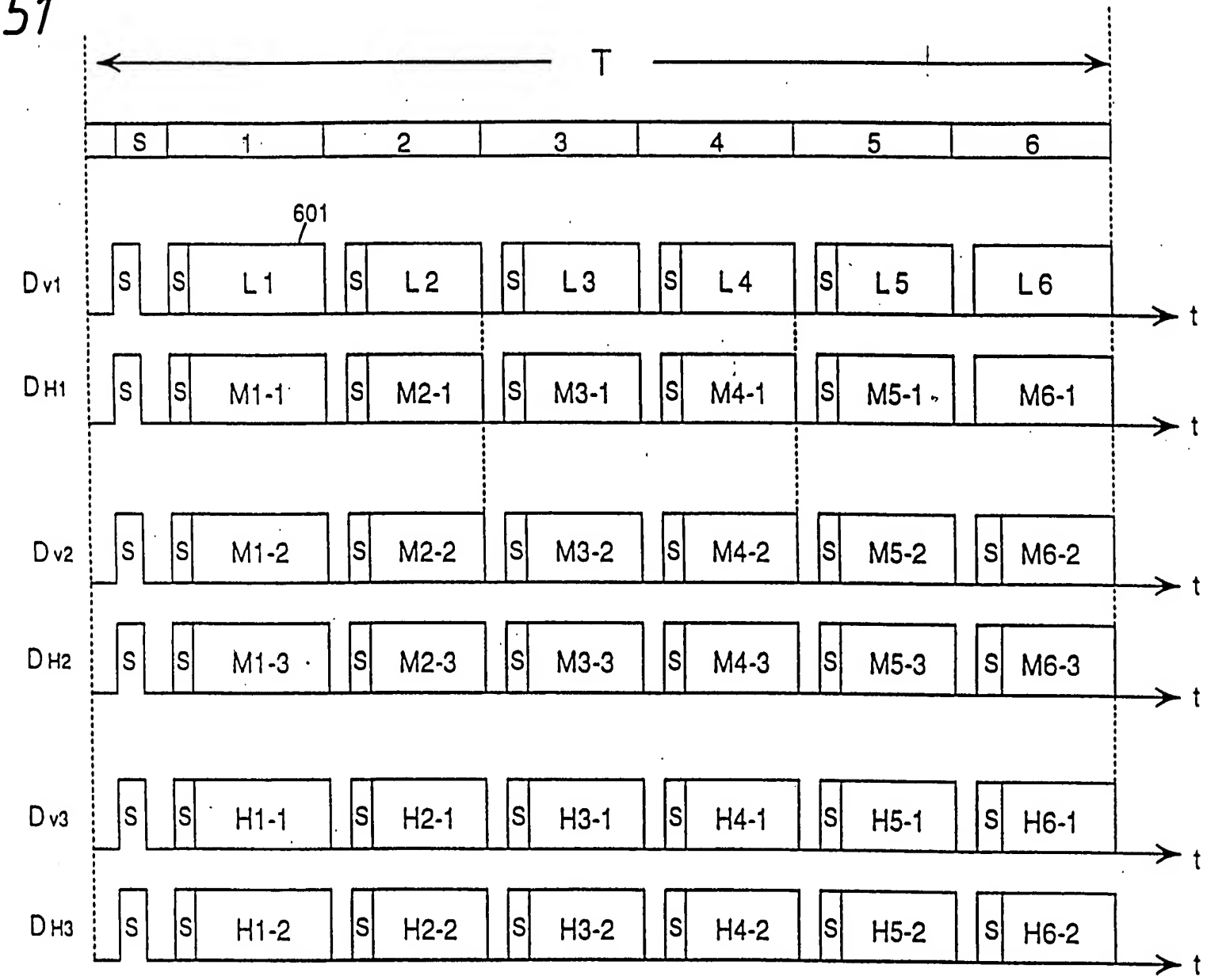

T
S
1
2
3
4
5
6
601
Dv1
L1
L2
L3
L4
L5
L6
DH1
M1-1
M2-1
M3-1
M4-1
M5-1
M6-1
Dv2
M1-2
M2-2
M3-2
M4-2
M5-2
M6-2
DH2
M1-3
M2-3
M3-3
M4-3
M5-3
M6-3
Dv3
H1-1
H2-1
H3-1
H4-1
H5-1
H6-1
DH3
H1-2
H2-2
H3-2
H4-2
H5-2
H6-2
t

FIG. 52

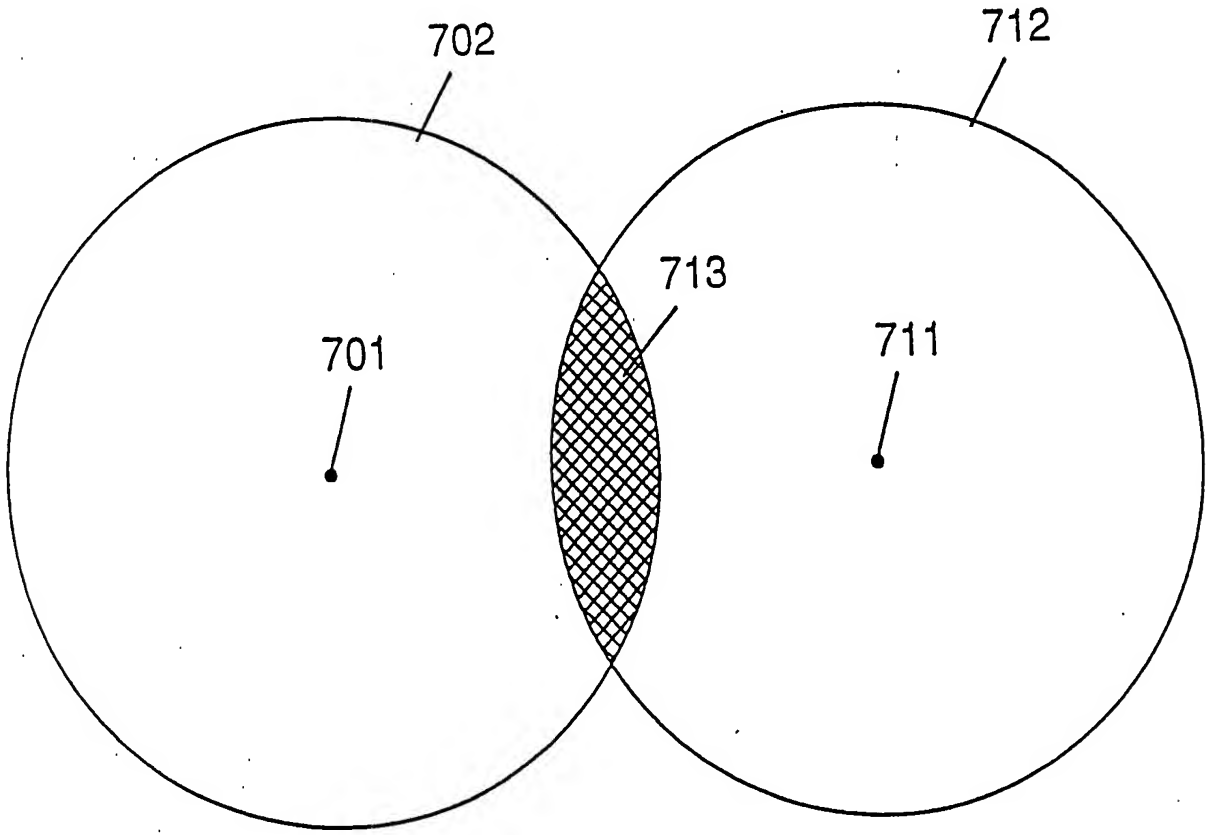


FIG. 53

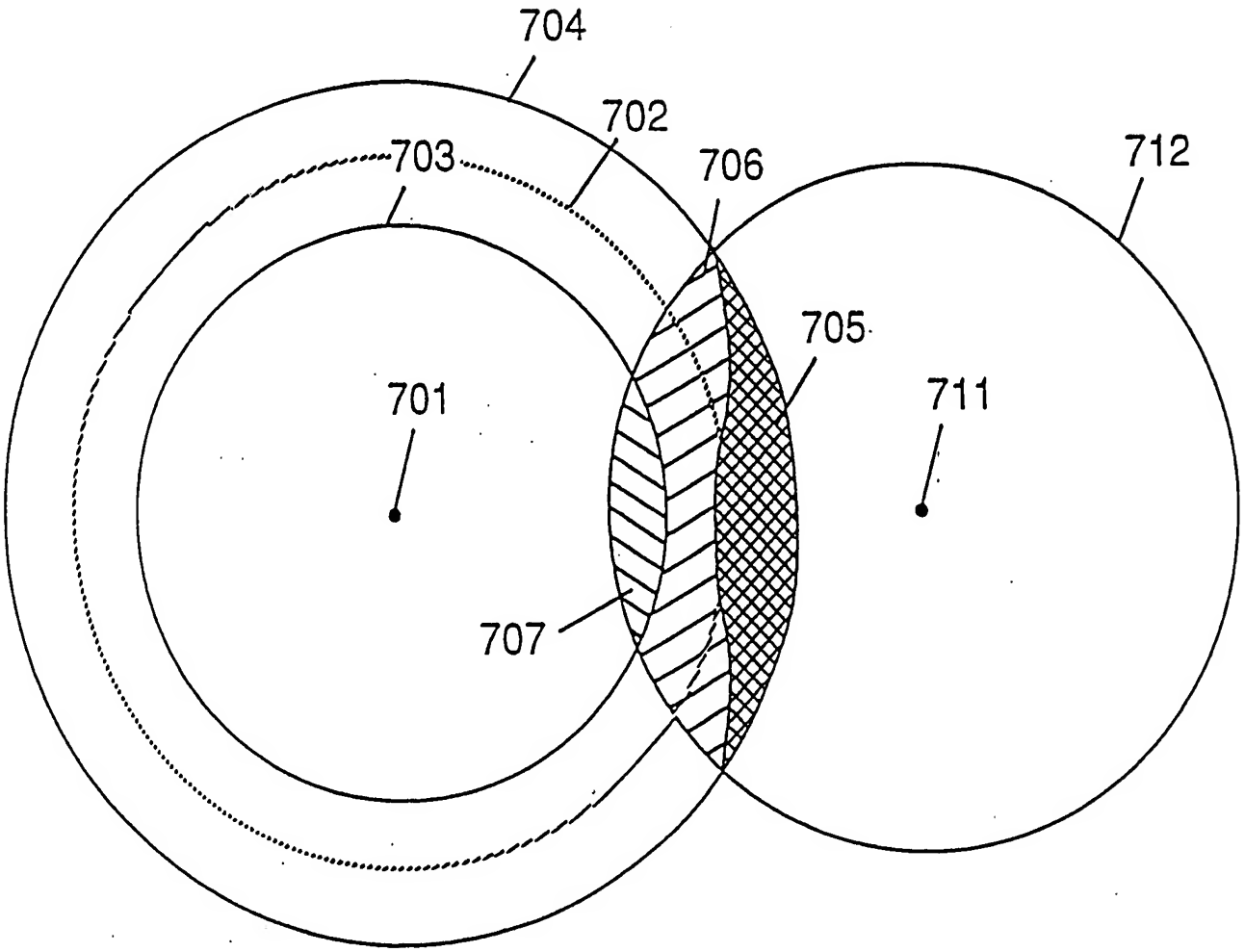


FIG. 54

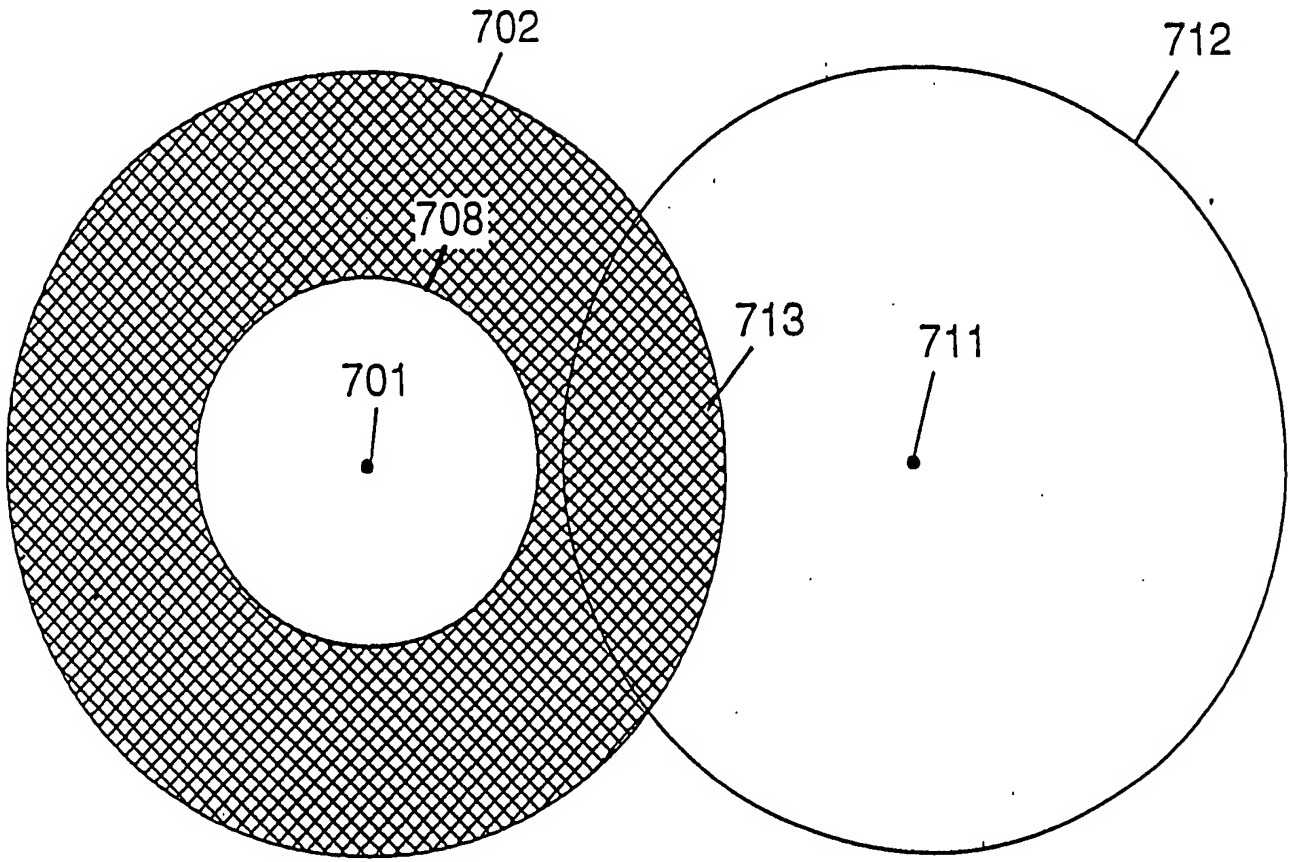


FIG. 55

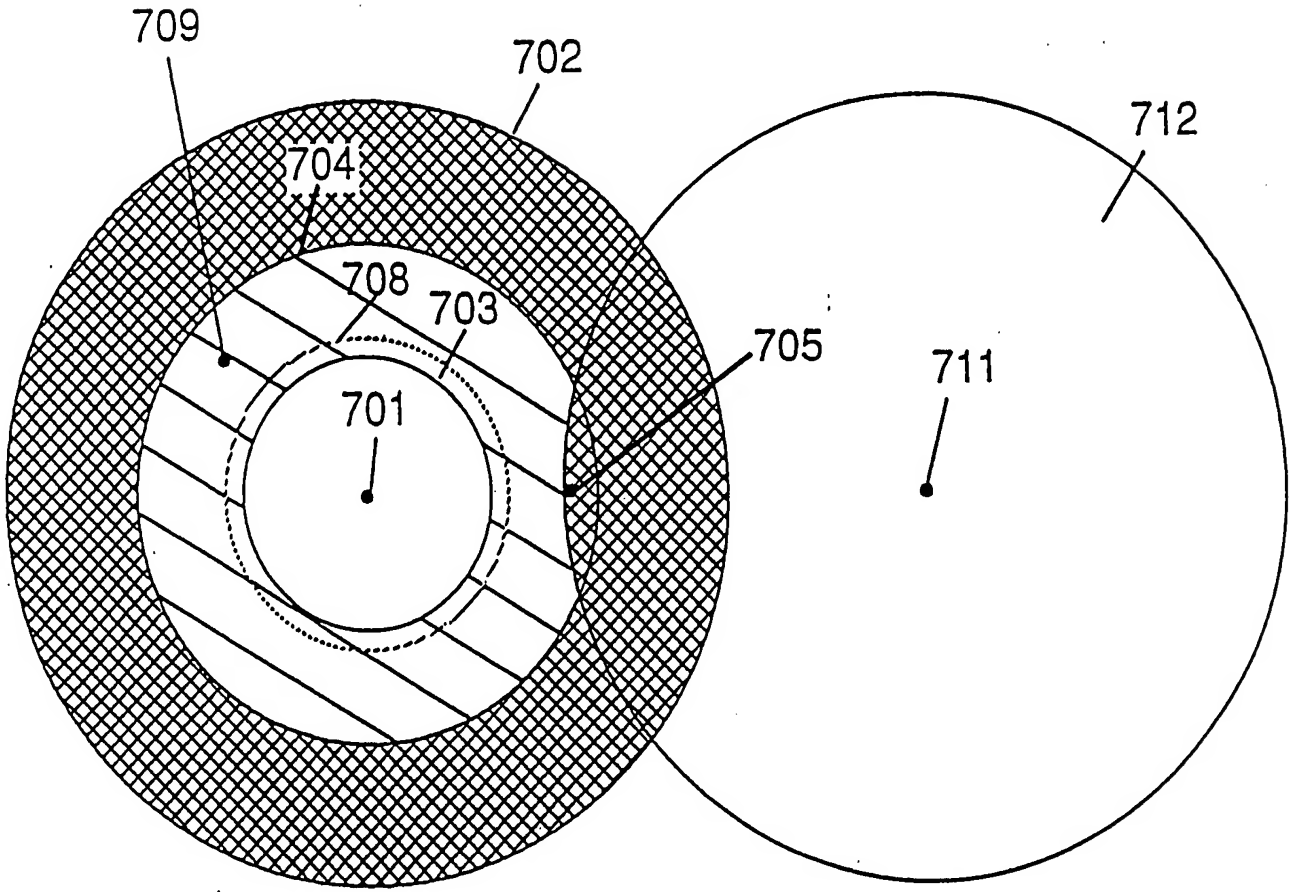


FIG. 56

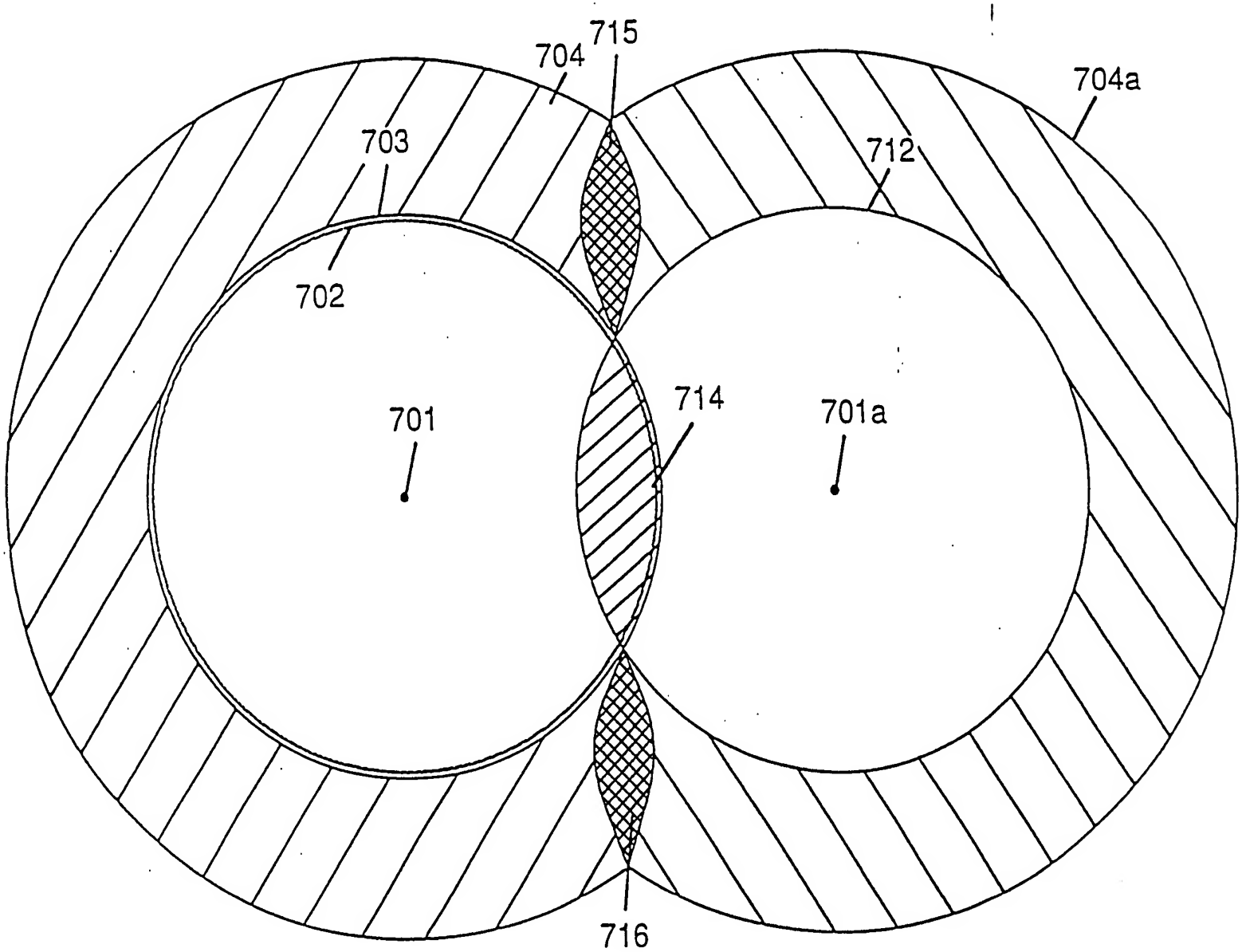


FIG. 57

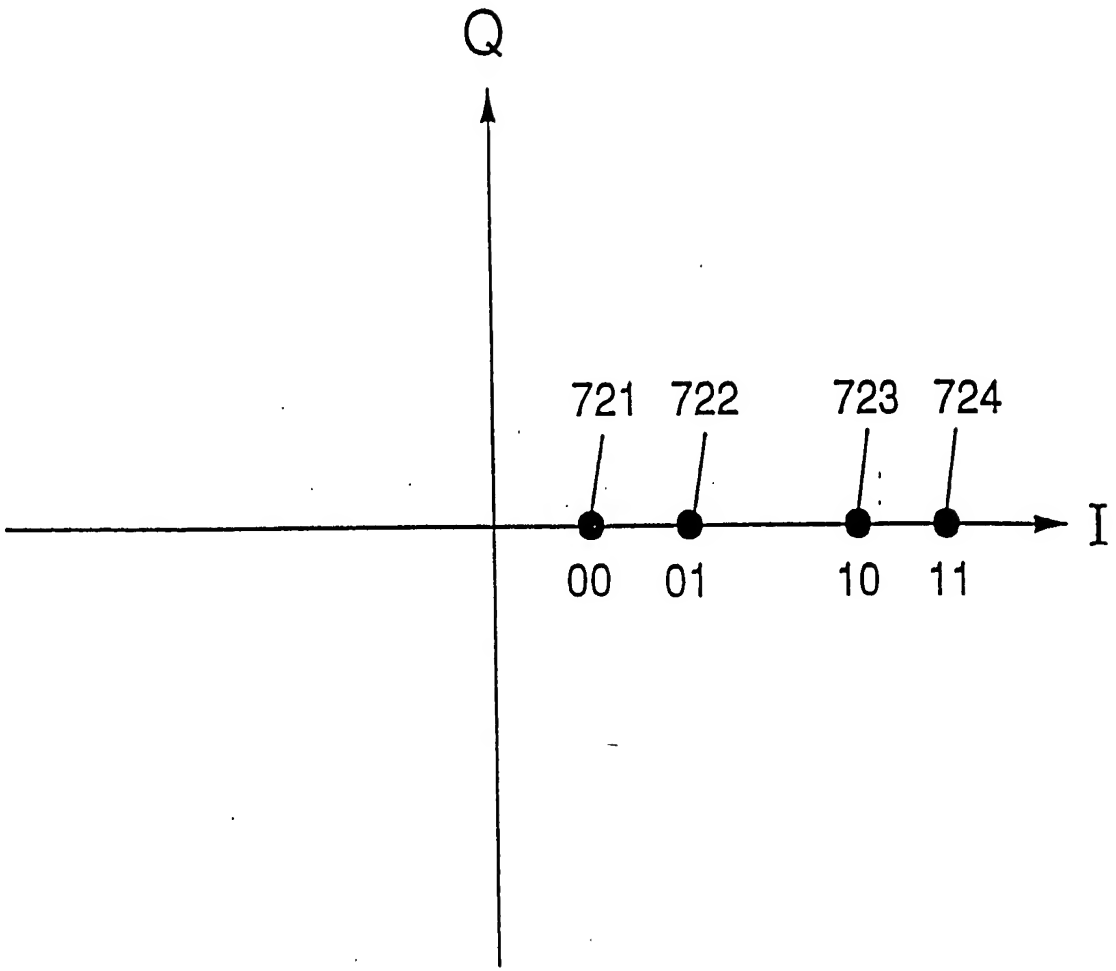


FIG. 58

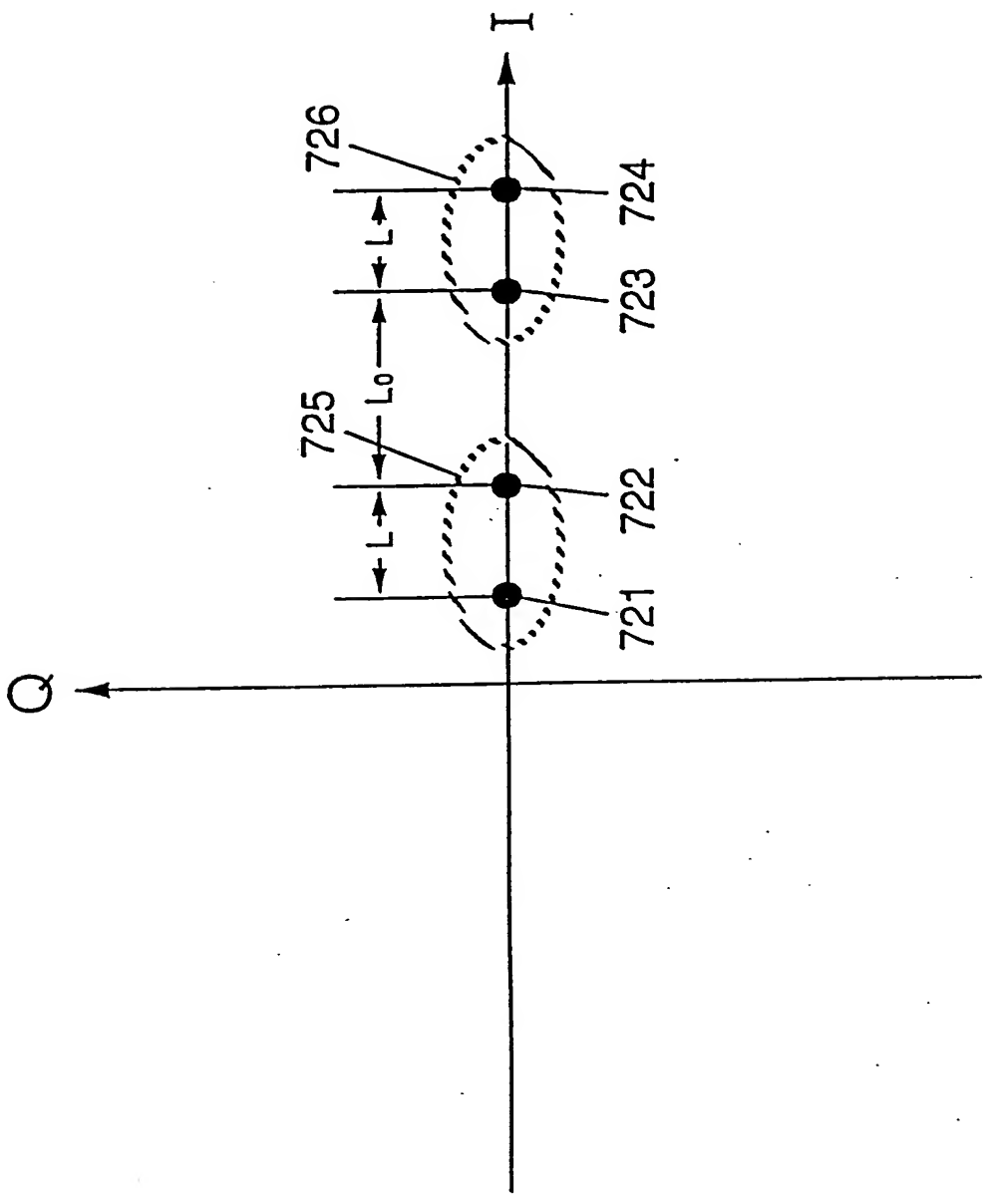


FIG. 59(a)

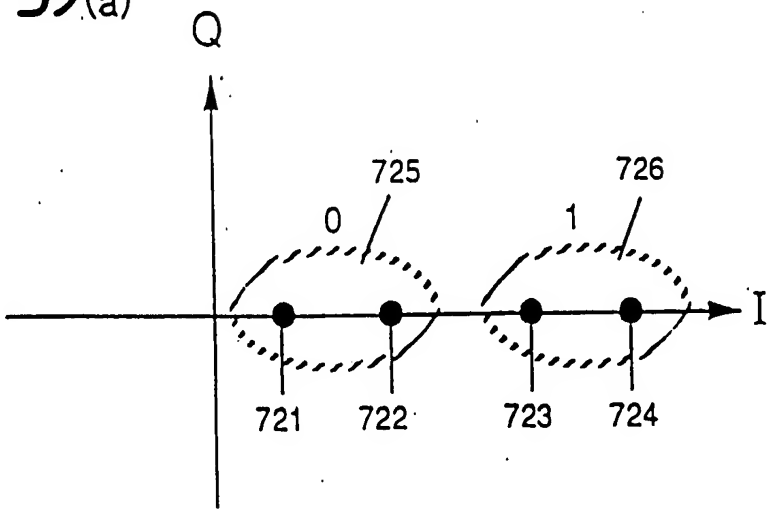


FIG. 59(b)

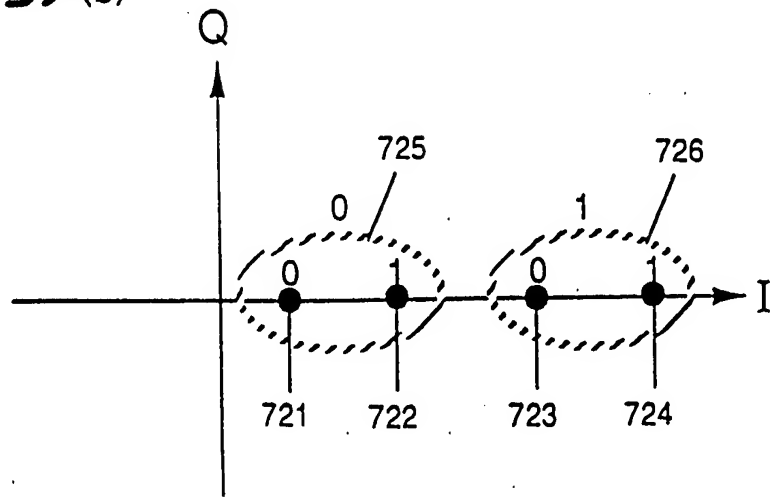


FIG. 59(c)

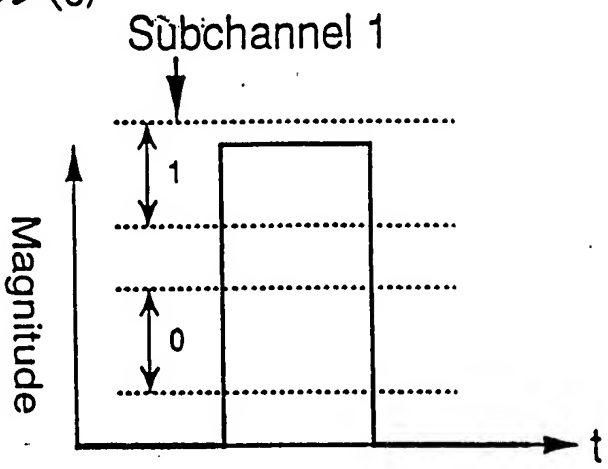


FIG. 59(d)

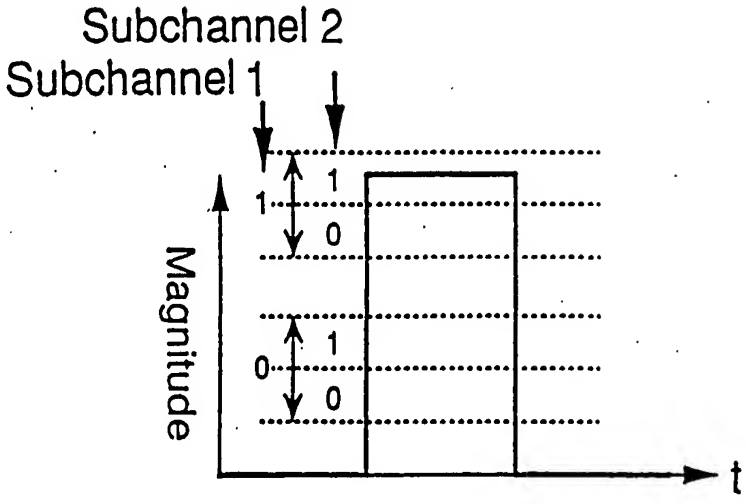


FIG. 60

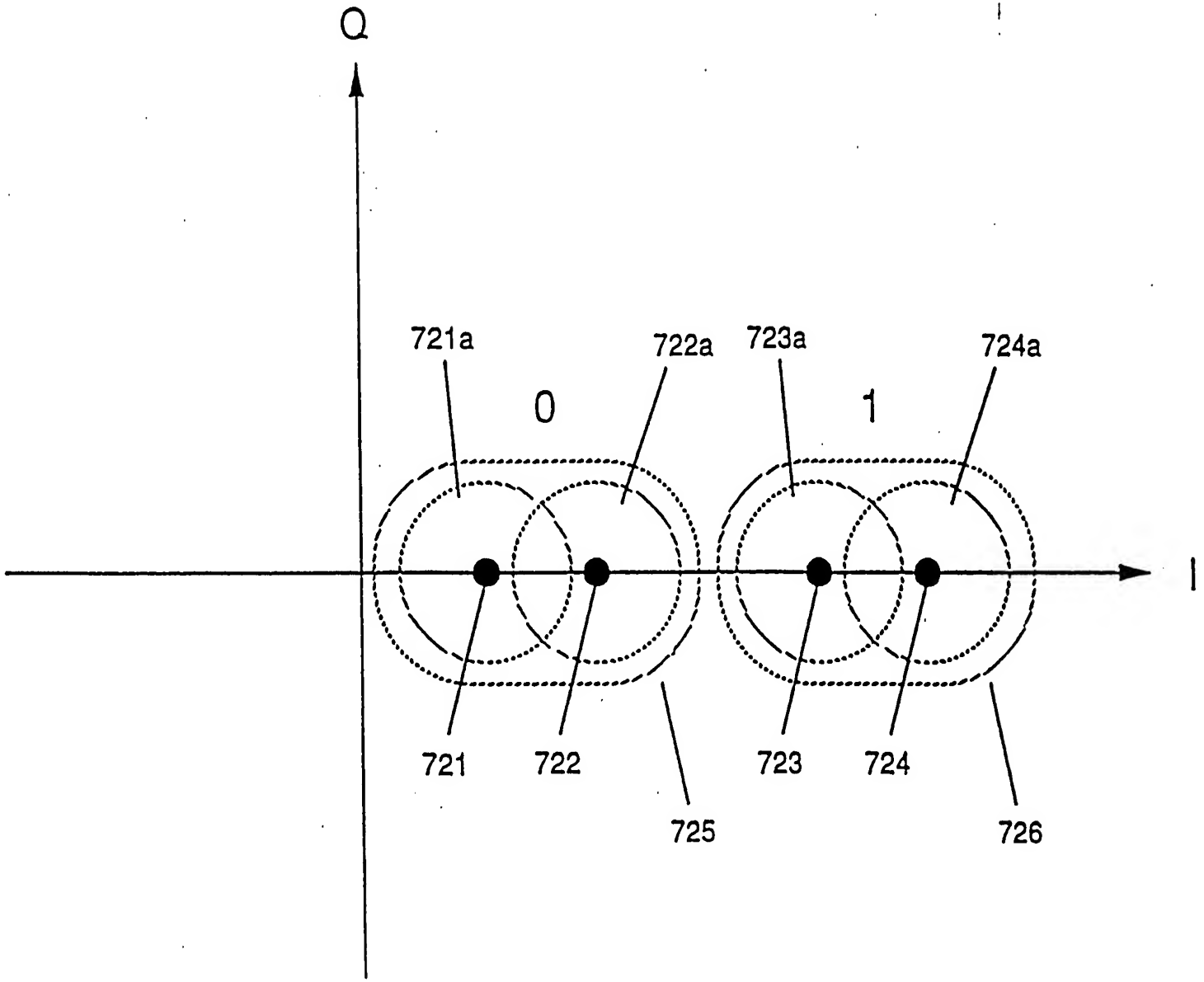


FIG. 61

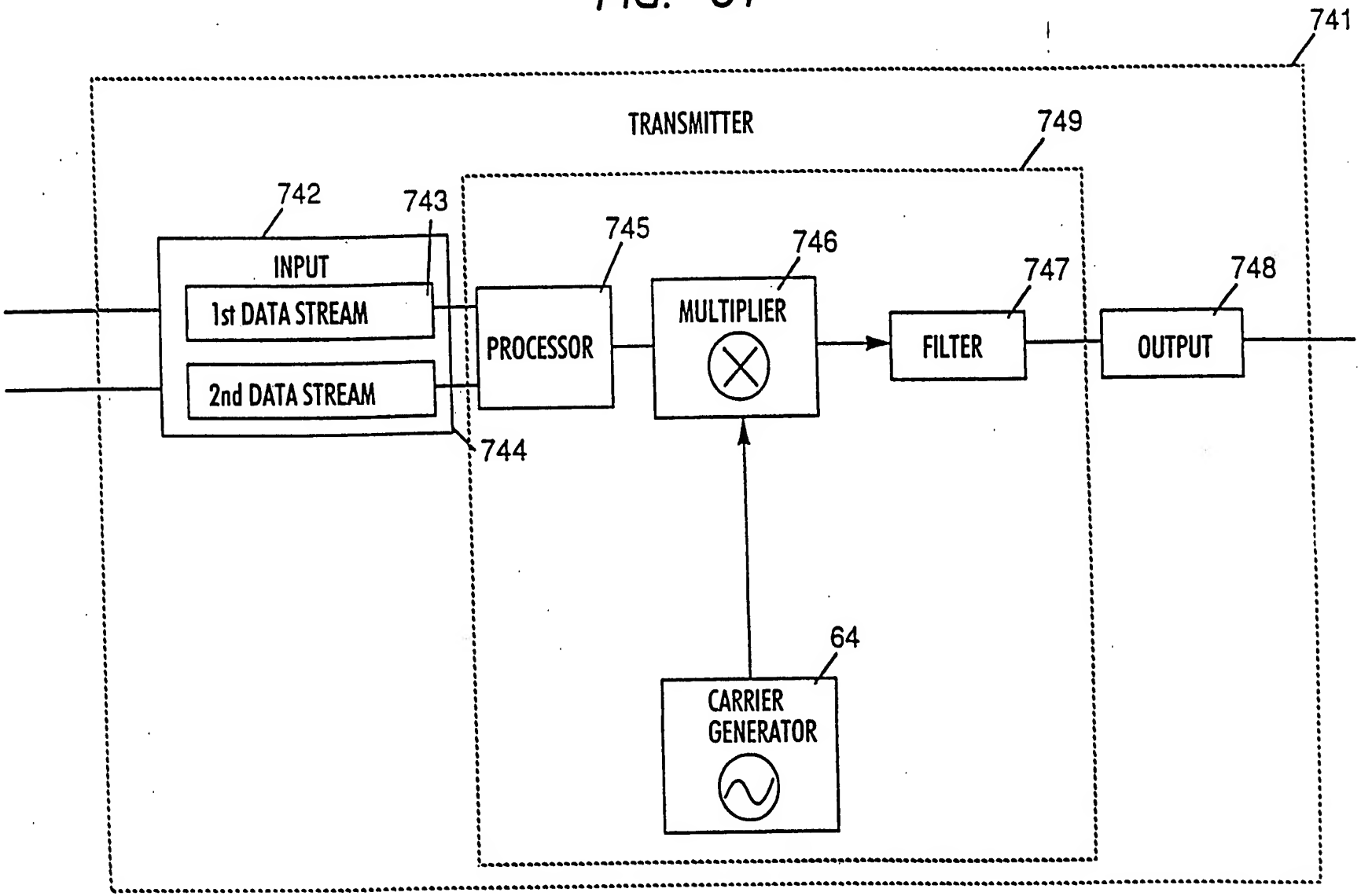

741
TRANSMITTER
749
742
743
745
746
747
748
INPUT
1st DATA STREAM
2nd DATA STREAM
PROCESSOR
MULTIPLIER
FILTER
OUTPUT
744
64
CARRIER GENERATOR

FIG. 62 (a)

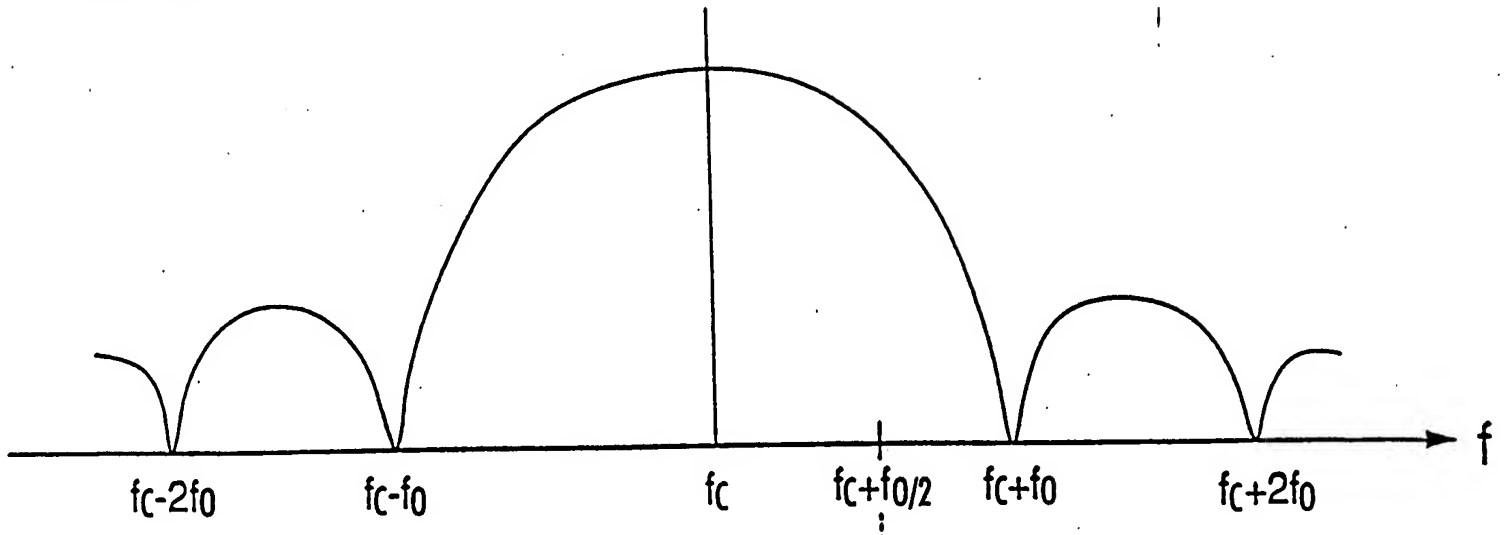


FIG. 62 (b)

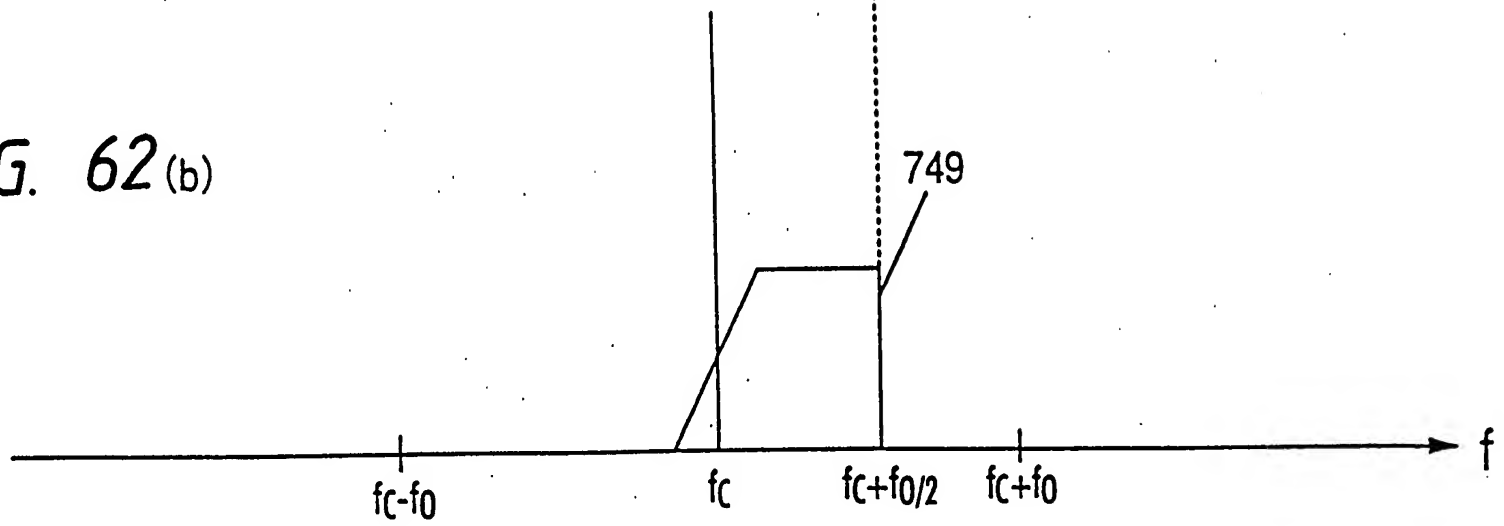


FIG. 63

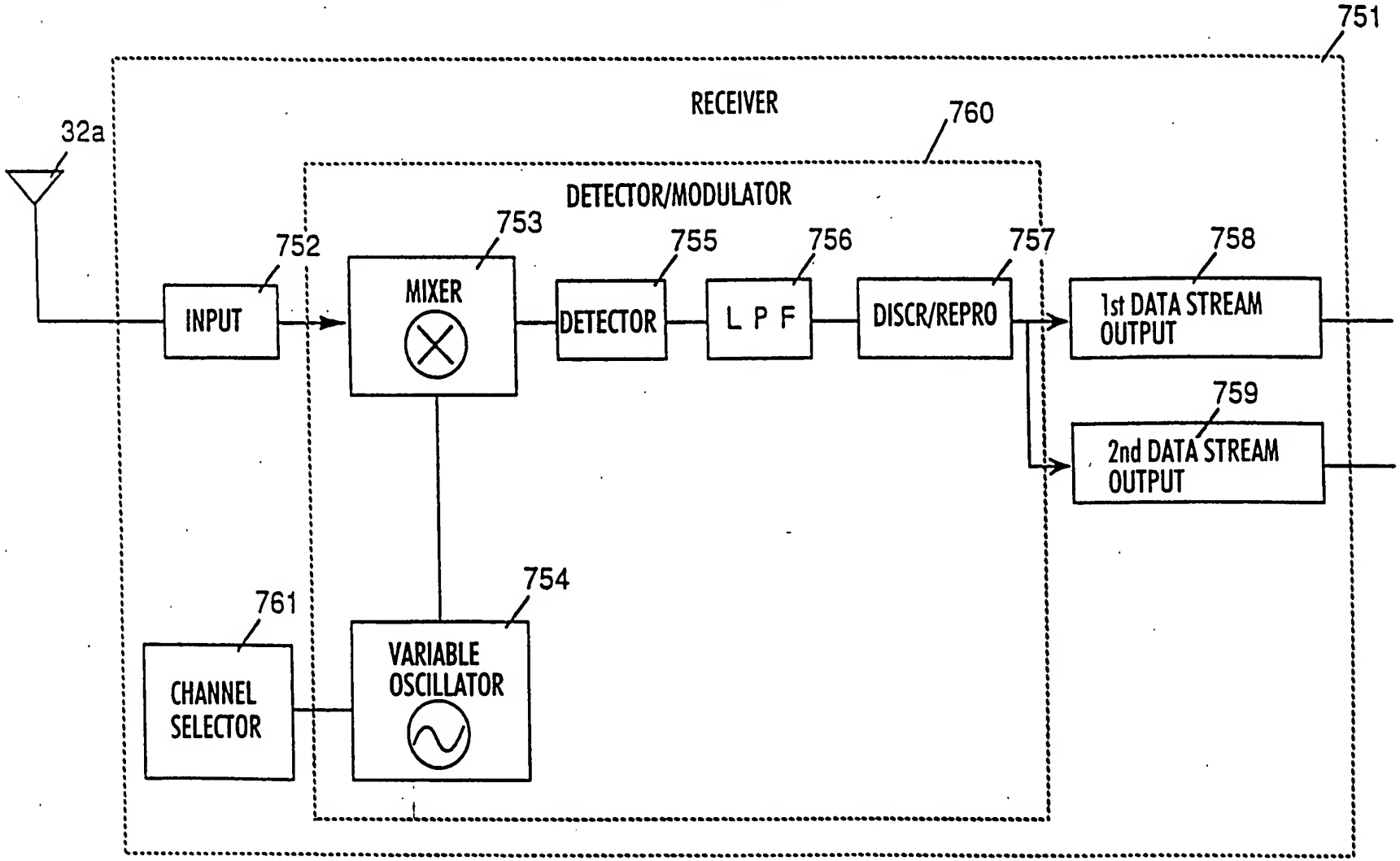

751
RECEIVER
760
32a
DETECTOR/MODULATOR
752
753
755
756
757
758
INPUT
MIXER
DETECTOR
L P F
DISCR/REPRO
1st DATA STREAM OUTPUT
759
2nd DATA STREAM OUTPUT
754
761
CHANNEL SELECTOR
VARIABLE OSCILLATOR

FIG. 64

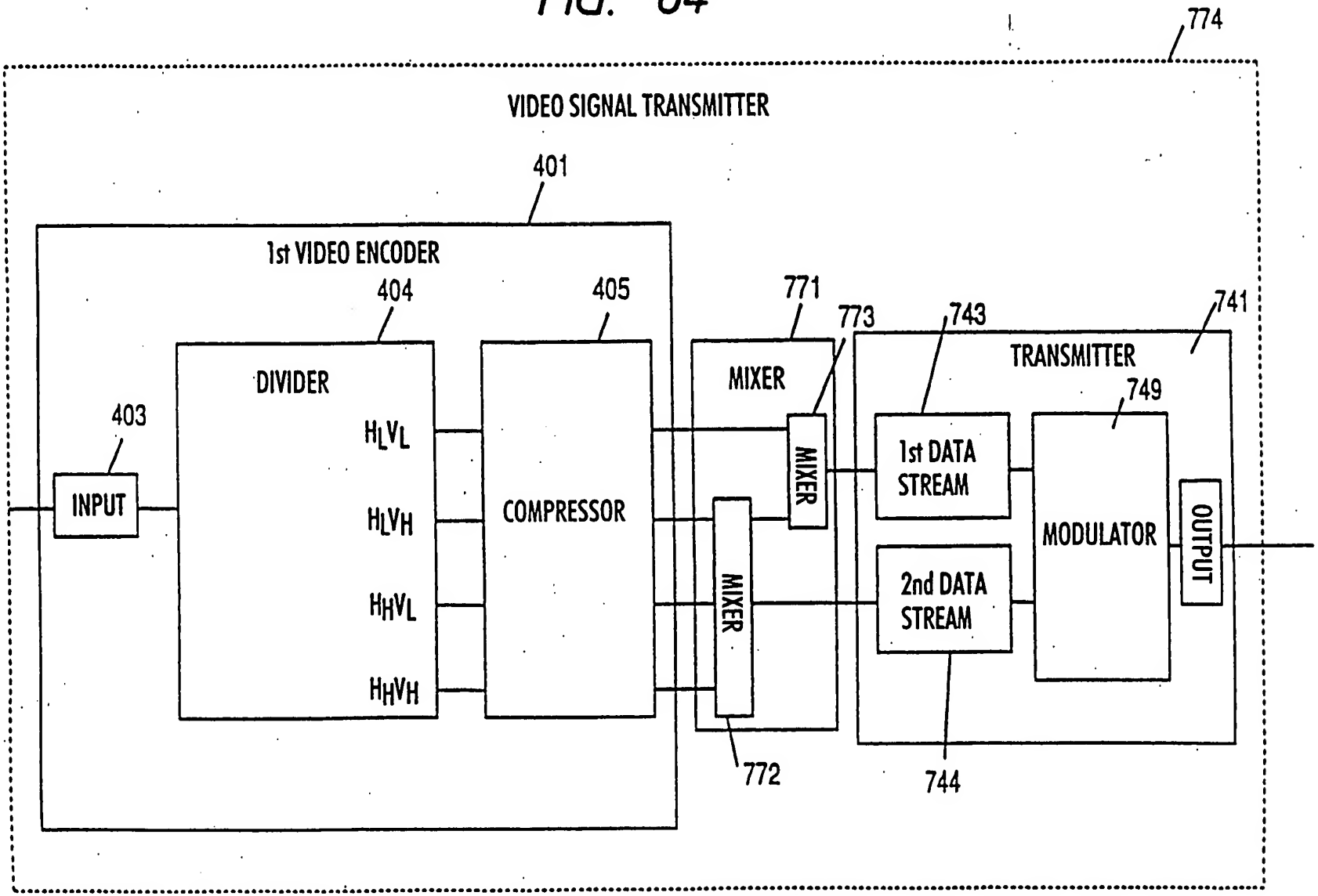

774
VIDEO SIGNAL TRANSMITTER
401
1st VIDEO ENCODER
404
405
771
773
743
741
TRANSMITTER
DIVIDER
MIXER
749
403
H_LV_L
H_LV_H
H_HV_L
H_HV_H
INPUT
COMPRESSOR
MIXER
1st DATA STREAM
MODULATOR
OUTPUT
MIXER
2nd DATA STREAM
772
744

FIG. 65

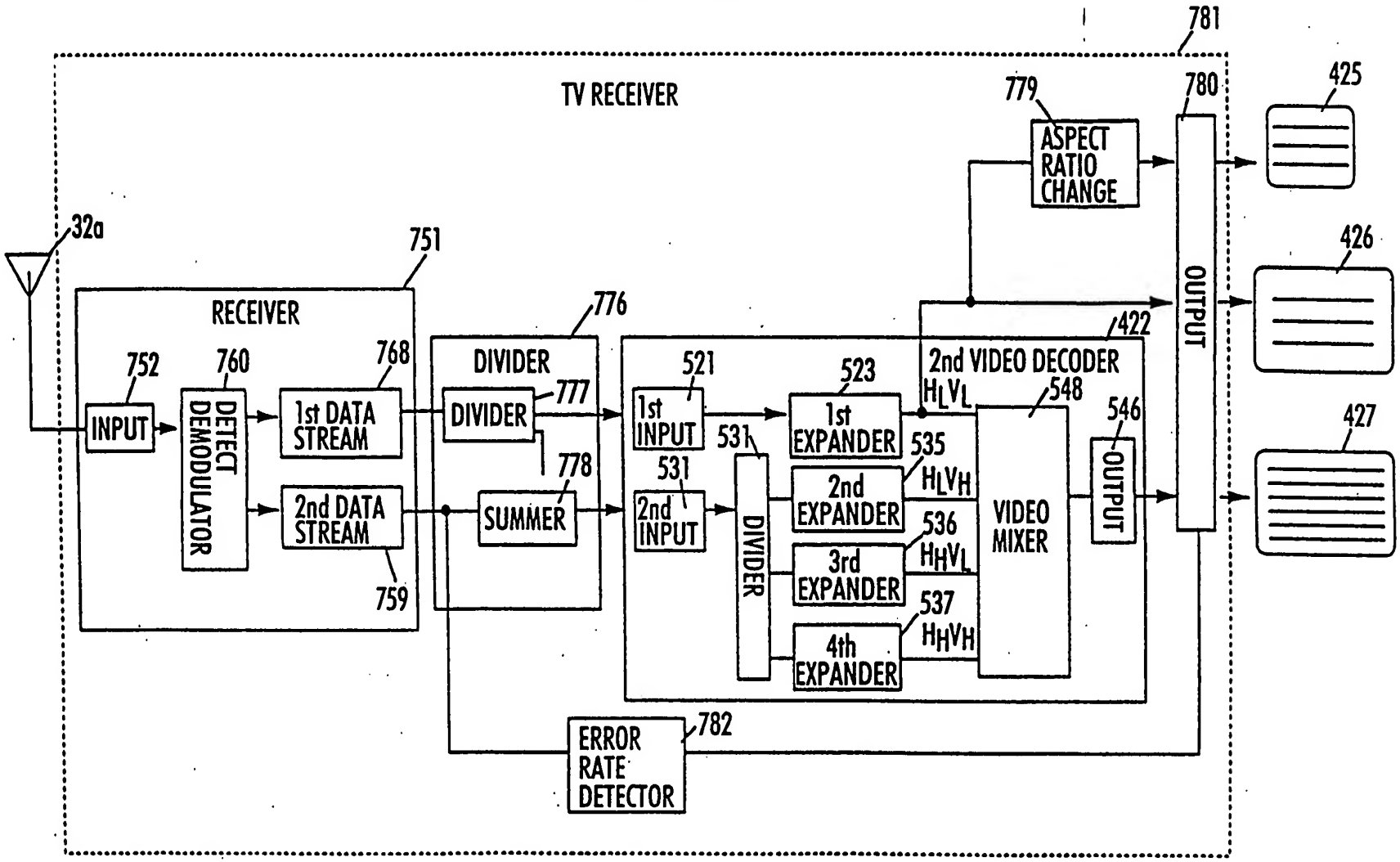

781
TV RECEIVER
779
ASPECT RATIO CHANGE
780
425
426
427
OUTPUT
32a
751
RECEIVER
752
INPUT
760
DETECT DEMODULATOR
768
1st DATA STREAM
2nd DATA STREAM
759
776
DIVIDER
DIVIDER
777
778
SUMMER
422
2nd VIDEO DECODER
521
1st INPUT
531
2nd INPUT
531
DIVIDER
523
1st EXPANDER
2nd EXPANDER
3rd EXPANDER
4th EXPANDER
535
536
537
HLVH
HHVL
HHVH
HLVL
548
VIDEO MIXER
546
OUTPUT
782
ERROR RATE DETECTOR

FIG. 66

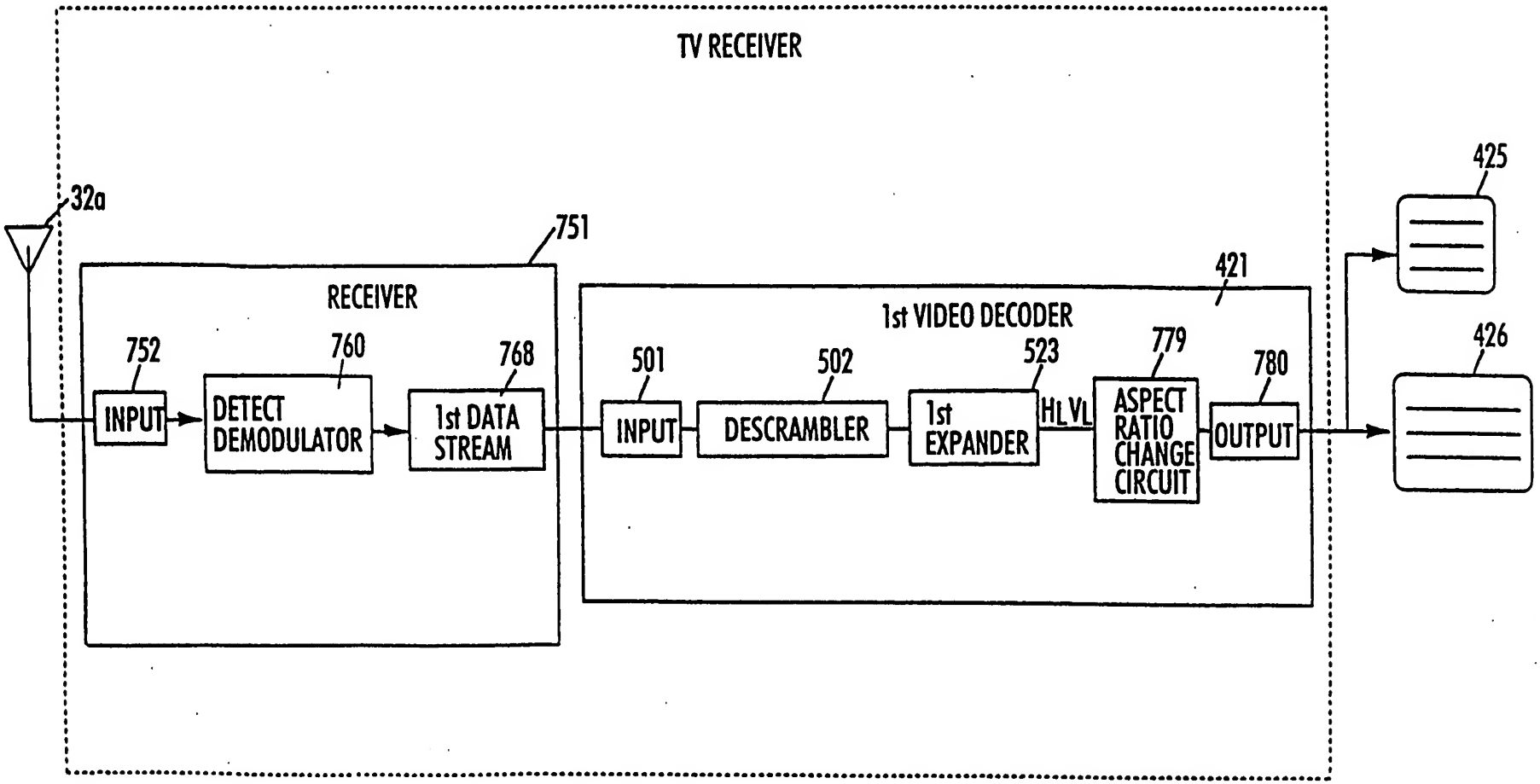

TV RECEIVER
32a
751
RECEIVER
752
INPUT
760
DETECT DEMODULATOR
768
1st DATA STREAM
421
1st VIDEO DECODER
501
INPUT
502
DESCRAMBLER
523
1st EXPANDER
HL VL
779
ASPECT RATIO CHANGE CIRCUIT
780
OUTPUT
425
426

FIG. 67

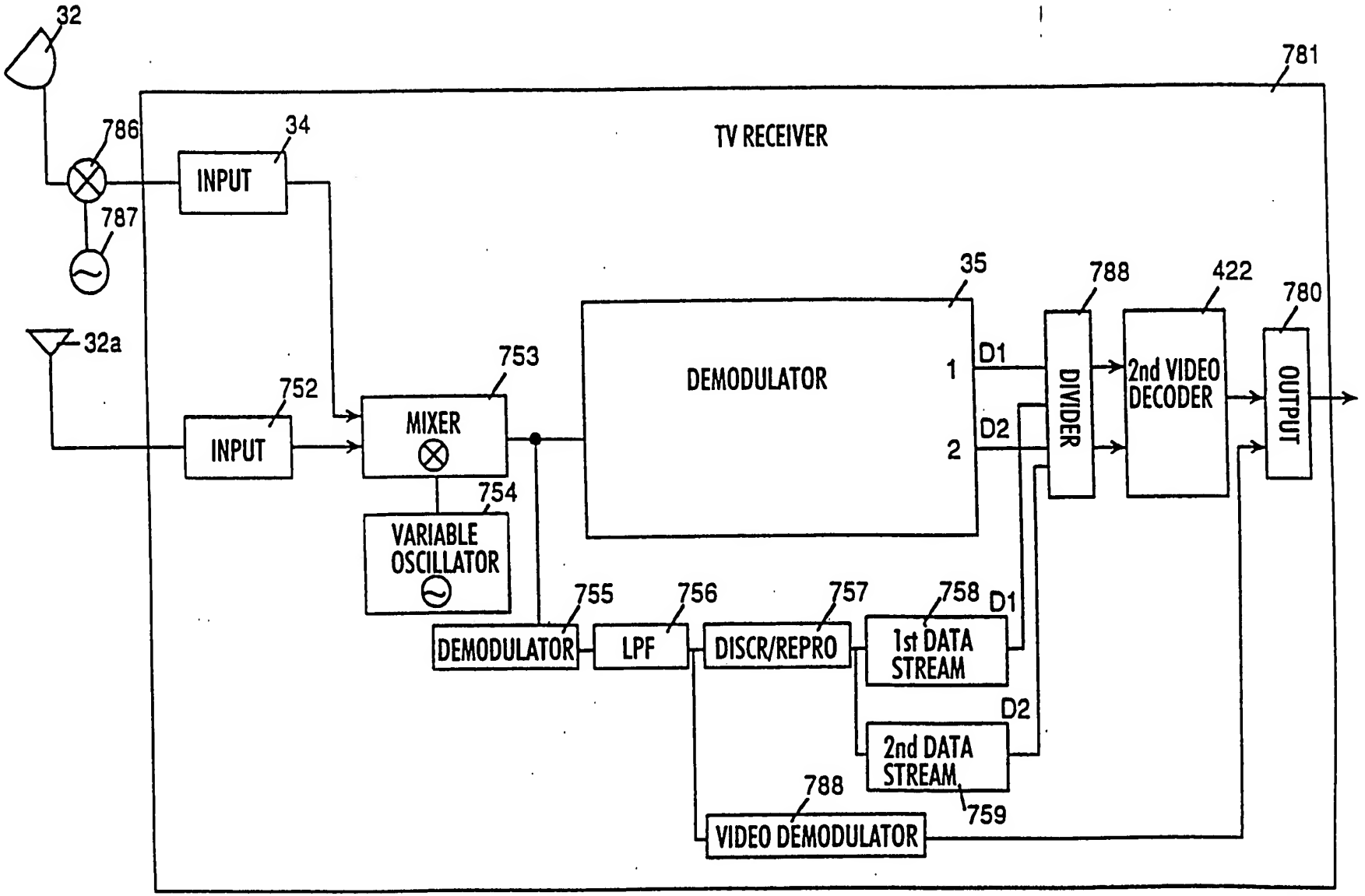

32
781
TV RECEIVER
786
34
INPUT
787
35
788
422
780
DEMODULATOR
1
2
D1
D2
DIVIDER
2nd VIDEO DECODER
OUTPUT
32a
753
752
INPUT
MIXER
754
VARIABLE OSCILLATOR
755
756
757
758
D1
DEMODULATOR
LPF
DISCR/REPRO
1st DATA STREAM
D2
2nd DATA STREAM
759
788
VIDEO DEMODULATOR

FIG. 68

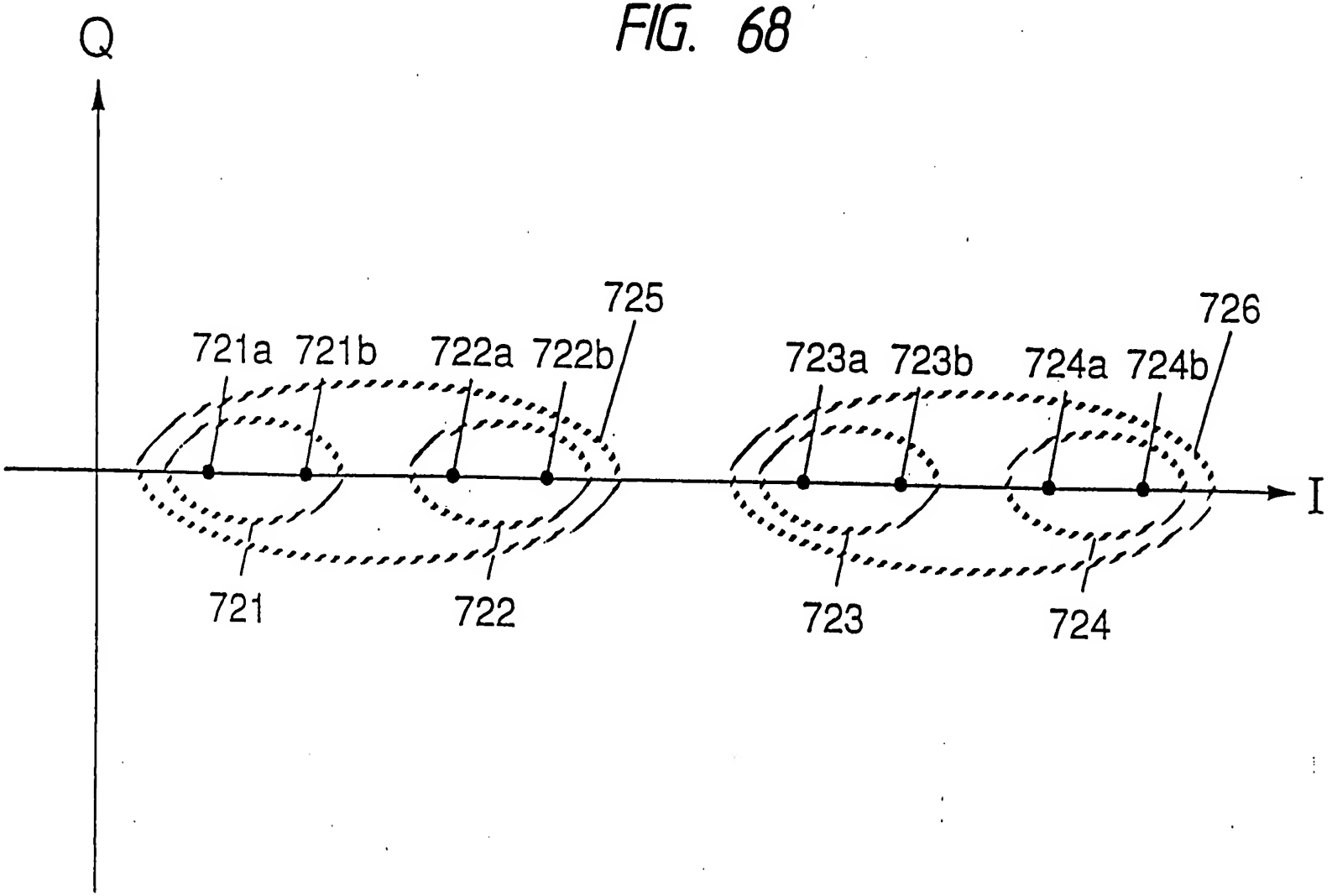

Q
I
721a
721b
722a
722b
725
723a
723b
724a
724b
726
721
722
723
724

FIG. 69

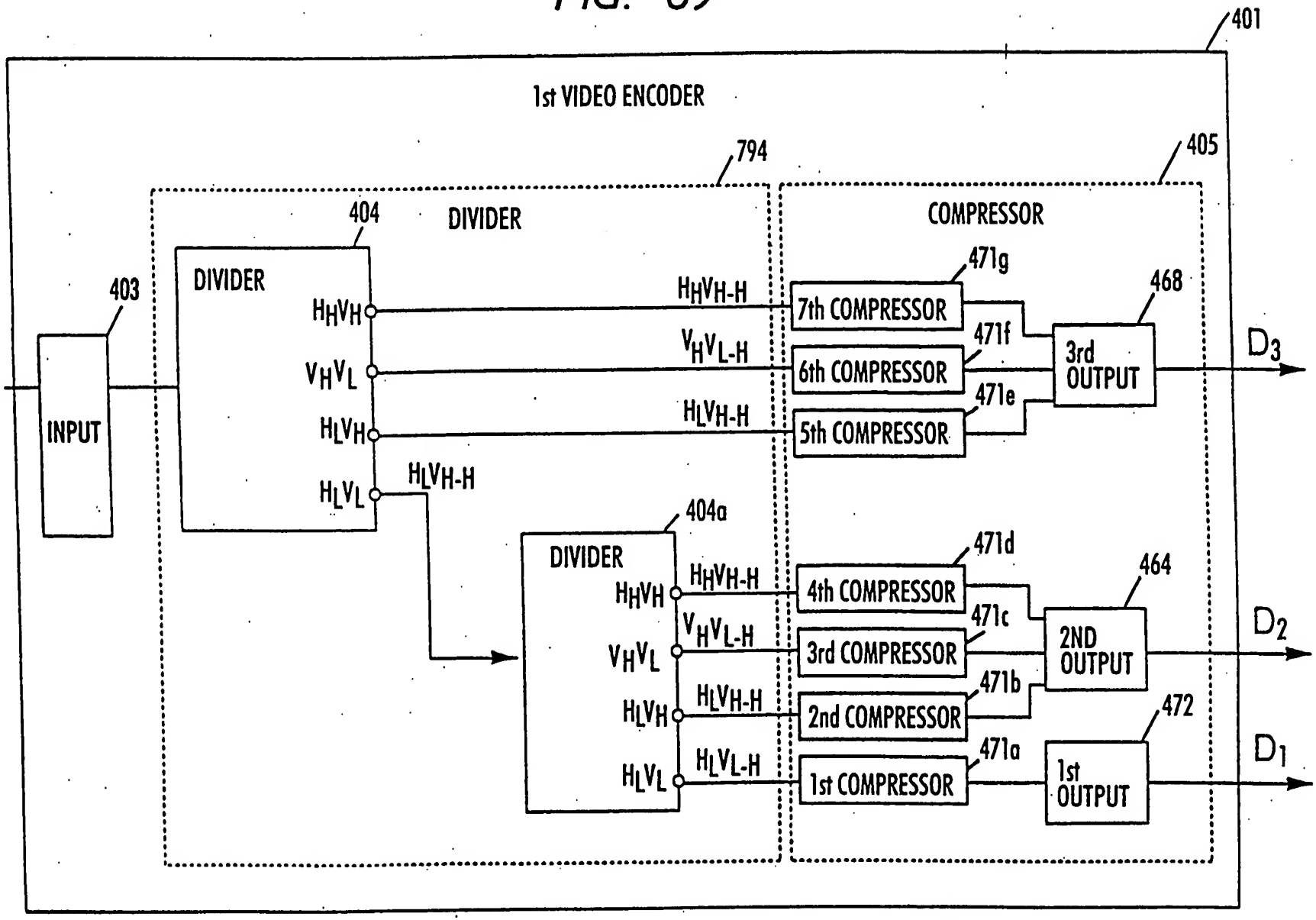

401
1st VIDEO ENCODER
794
405
DIVIDER
COMPRESSOR
404
DIVIDER
403
INPUT
H_HV_H
V_HV_L
H_LV_H
H_LV_L
H_HV_H-H
V_HV_L-H
H_LV_H-H
H_LV_L-H
471g
7th COMPRESSOR
471f
6th COMPRESSOR
471e
5th COMPRESSOR
468
3rd OUTPUT
D_3
404a
DIVIDER
H_HV_H
V_HV_L
H_LV_H
H_LV_L
H_HV_H-H
V_HV_L-H
H_LV_H-H
H_LV_L-H
471d
4th COMPRESSOR
471c
3rd COMPRESSOR
471b
2nd COMPRESSOR
471a
1st COMPRESSOR
464
2ND OUTPUT
D_2
472
1st OUTPUT
D_1

FIG. 70

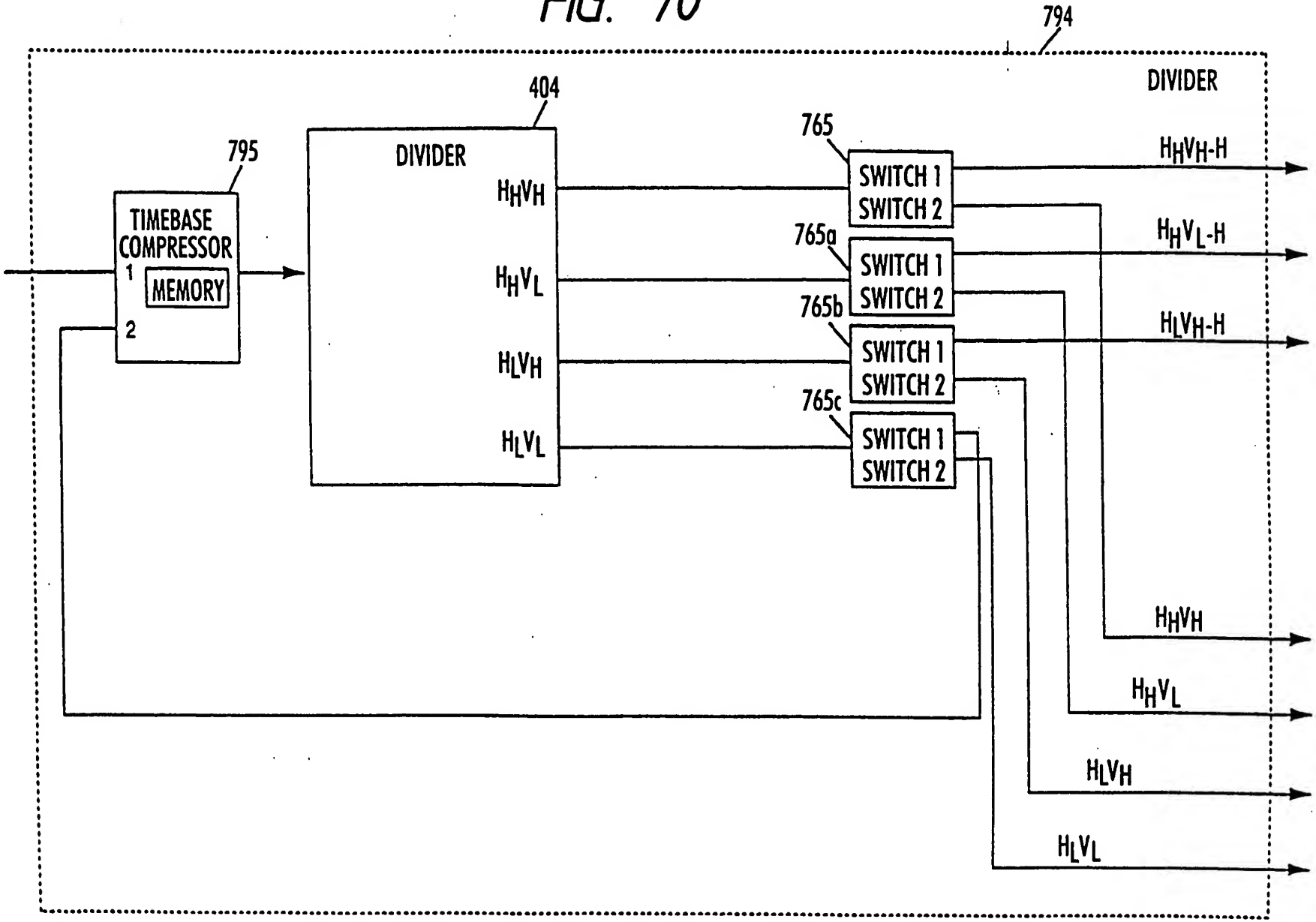

794
DIVIDER
404
DIVIDER
795
TIMEBASE COMPRESSOR
1
MEMORY
2
H_HV_H
H_HV_L
H_LV_H
H_LV_L
765
765a
765b
765c
SWITCH 1
SWITCH 2
H_HV_H-H
H_HV_L-H
H_LV_H-H
H_HV_H
H_HV_L
H_LV_H
H_LV_L

FIG. 71

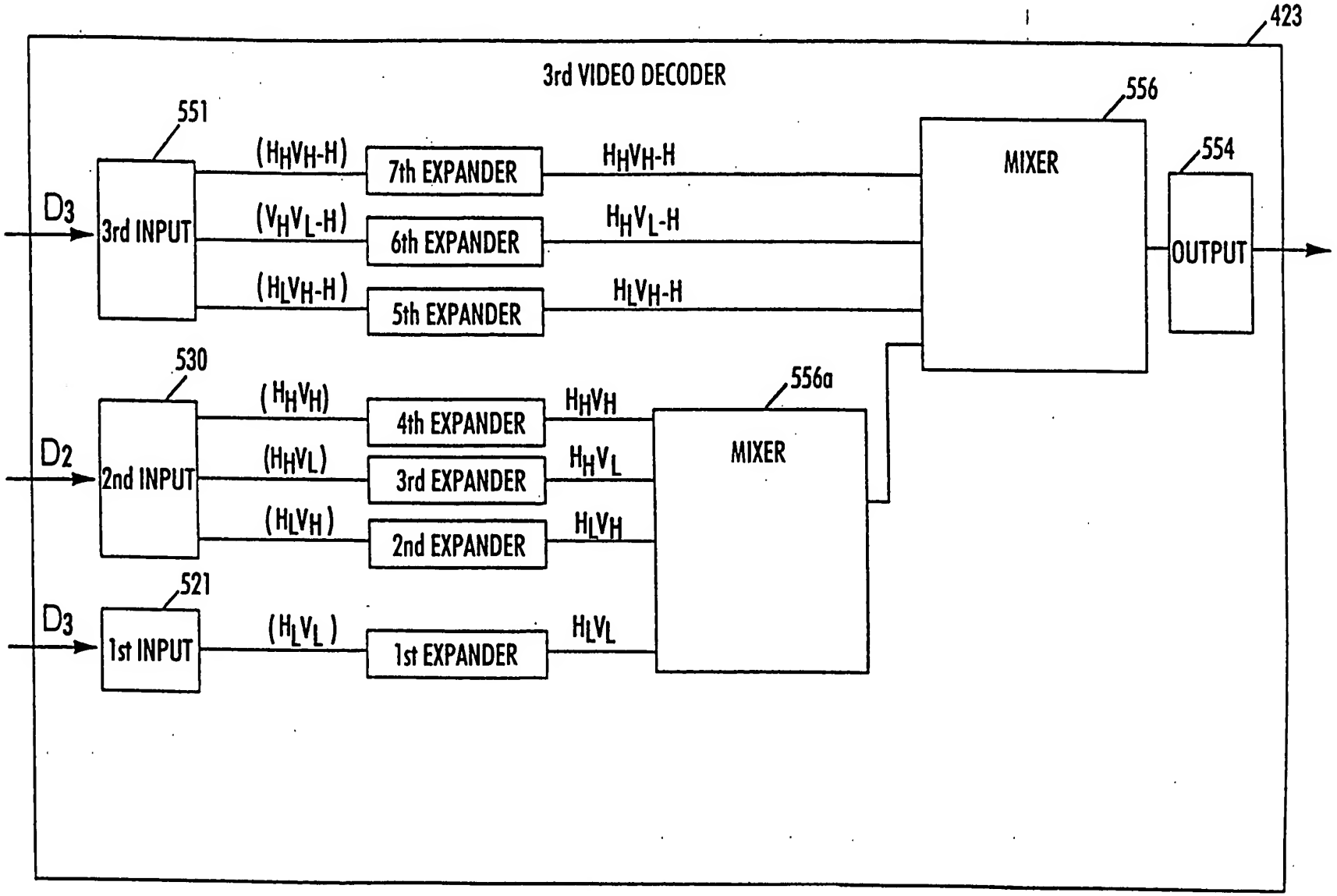

423
3rd VIDEO DECODER
551
556
554
D3
3rd INPUT
(HHVH-H)
7th EXPANDER
HHVH-H
MIXER
(VHVL-H)
6th EXPANDER
HHVL-H
OUTPUT
(HLVH-H)
5th EXPANDER
HLVH-H
530
556a
(HHVH)
4th EXPANDER
HHVH
D2
2nd INPUT
(HHVL)
3rd EXPANDER
HHVL
MIXER
(HLVH)
2nd EXPANDER
HLVH
521
D3
1st INPUT
(HLVL)
1st EXPANDER
HLVL

FIG. 72

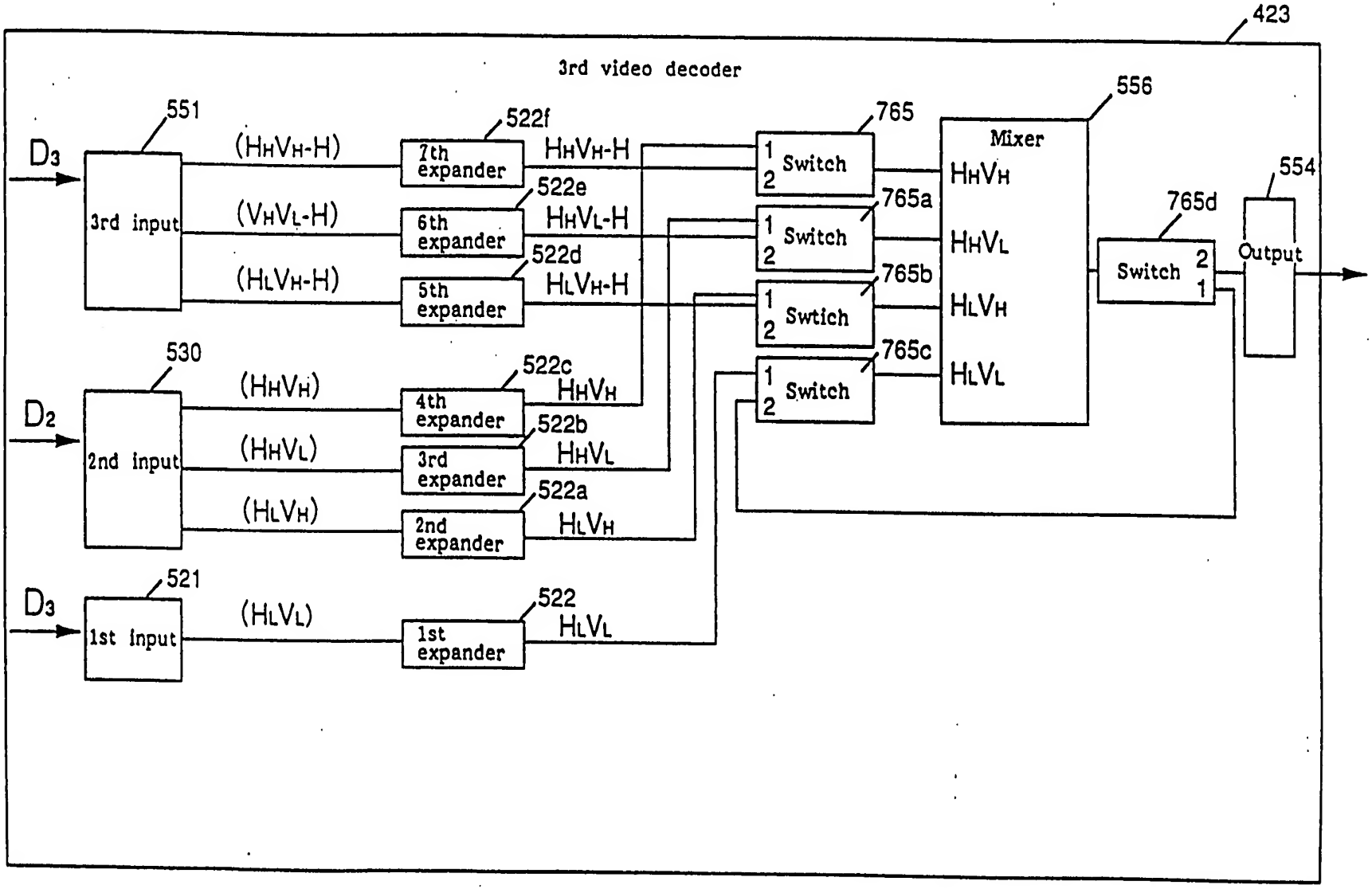

423
3rd video decoder
551
D3
3rd input
(HHVH-H)
(VHVL-H)
(HLVH-H)
522f
7th expander
HHVH-H
522e
6th expander
HHVL-H
522d
5th expander
HLVH-H
530
D2
2nd input
(HHVH)
(HHVL)
(HLVH)
522c
4th expander
HHVH
522b
3rd expander
HHVL
522a
2nd expander
HLVH
521
D3
1st input
(HLVL)
522
1st expander
HLVL
765
1
2
Switch
765a
Swtich
765b
765c
556
Mixer
HHVH
HHVL
HLVH
HLVL
765d
Switch
554
Output

FIG. 73

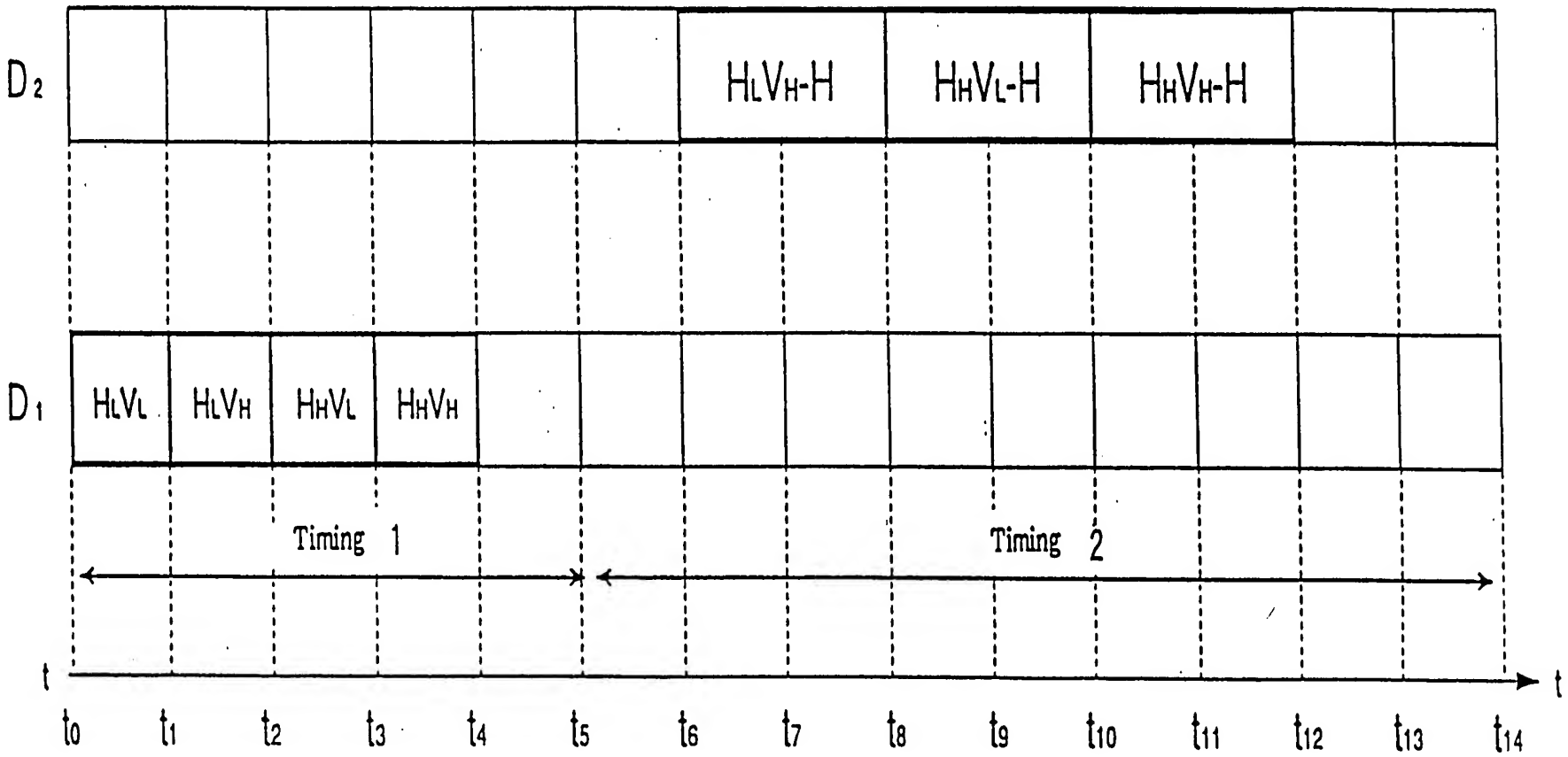

D2
HLVH-H
HHVL-H
HHVH-H
D1
HLVL
HLVH
HHVL
HHVH
Timing 1
Timing 2
t
t
t0
t1
t2
t3
t4
t5
t6
t7
t8
t9
t10
t11
t12
t13
t14

FIG. 74 (a)

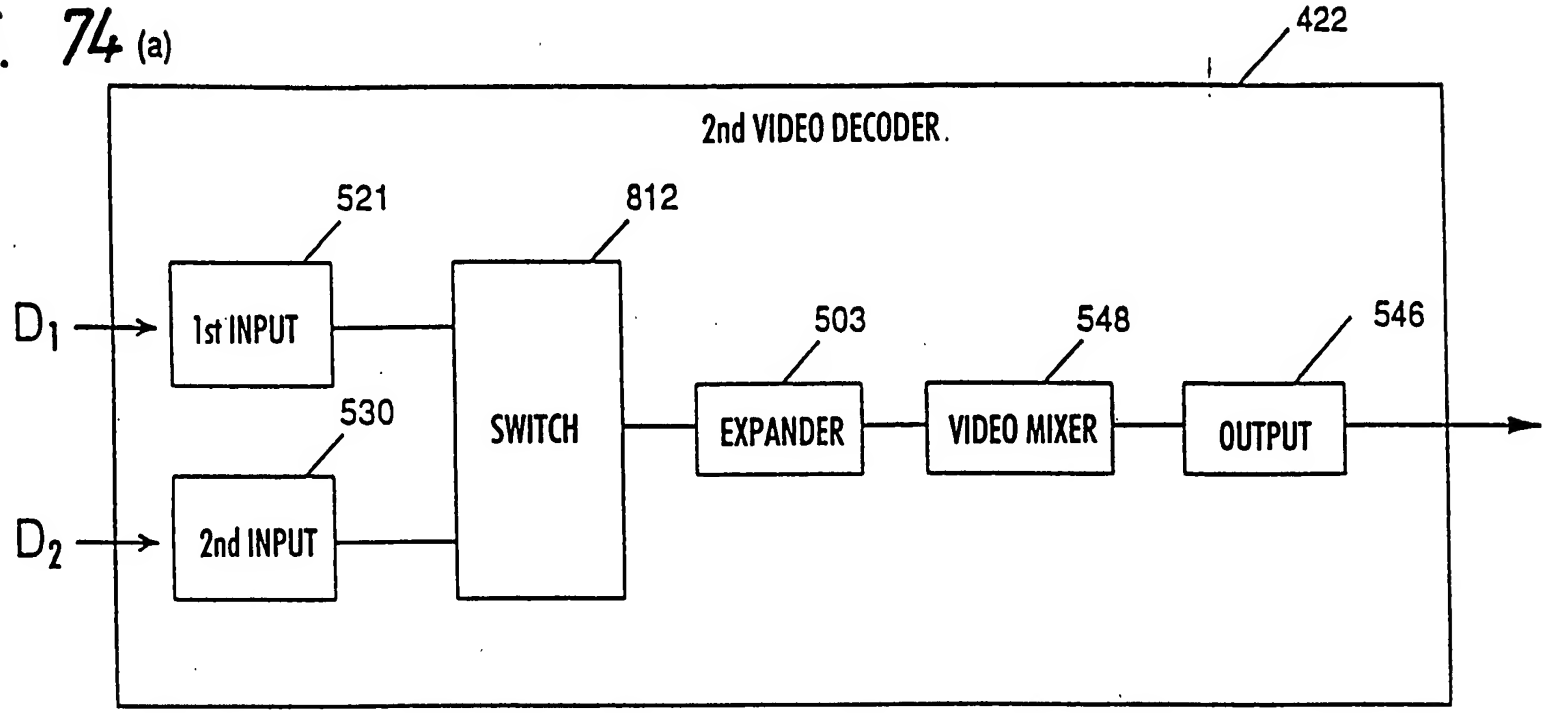


FIG. 74 (b)

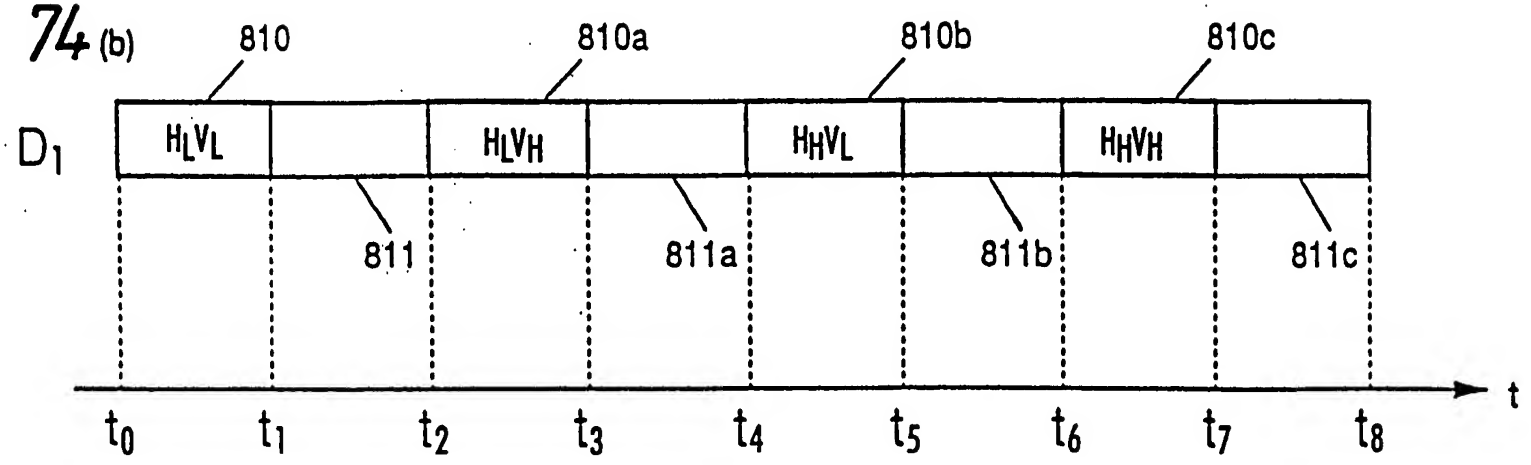


FIG. 75

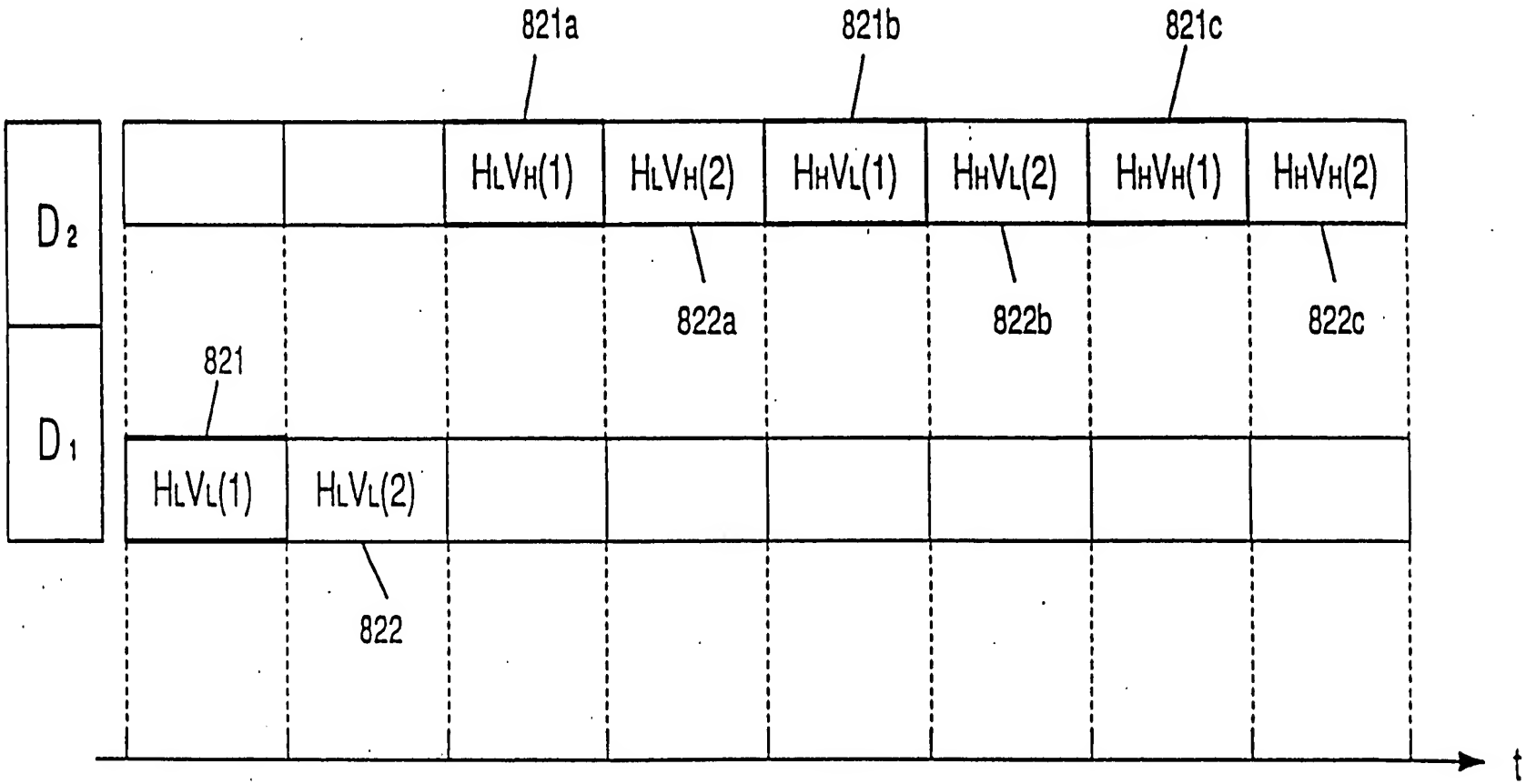

821a
821b
821c
D2
D1
HLVH(1)
HLVH(2)
HHVL(1)
HHVL(2)
HHVH(1)
HHVH(2)
822a
822b
822c
821
HLVL(1)
HLVL(2)
822
t

FIG. 76

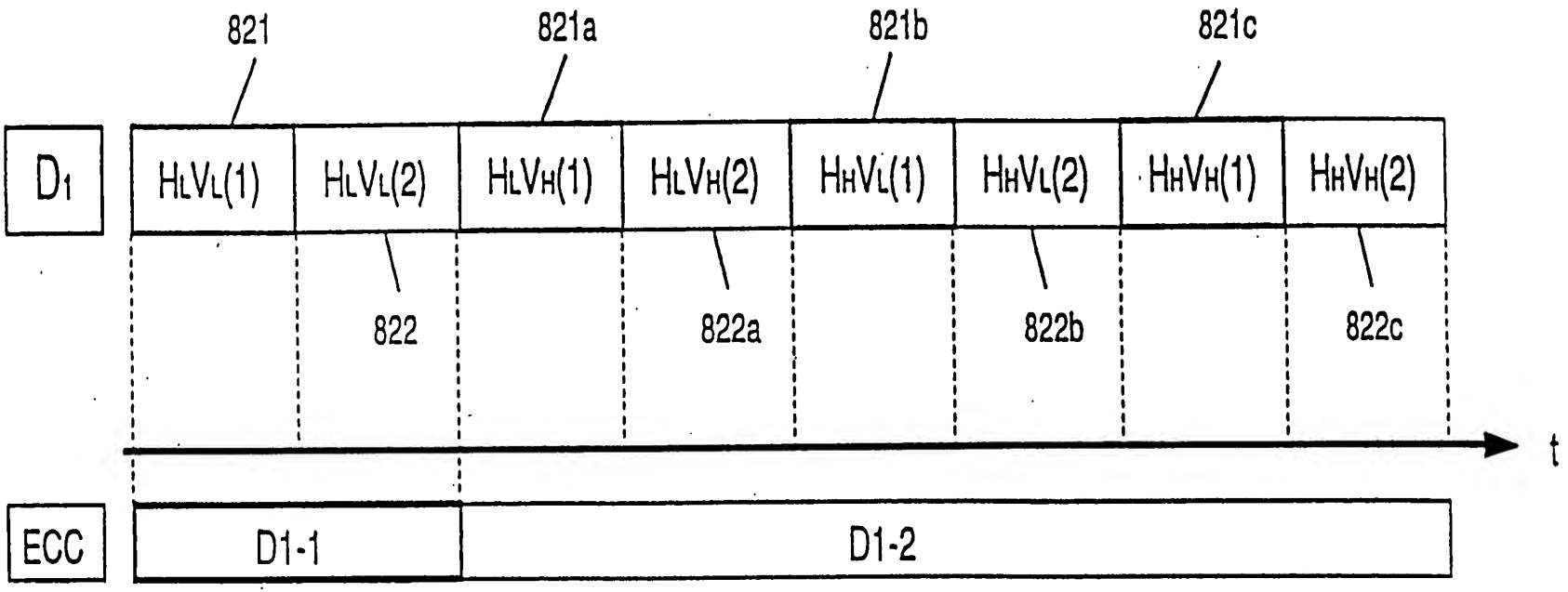

821
821a
821b
821c
D1
HLVL(1)
HLVL(2)
HLVH(1)
HLVH(2)
HHVL(1)
HHVL(2)
HHVH(1)
HHVH(2)
822
822a
822b
822c
t
ECC
D1-1
D1-2

FIG. 77

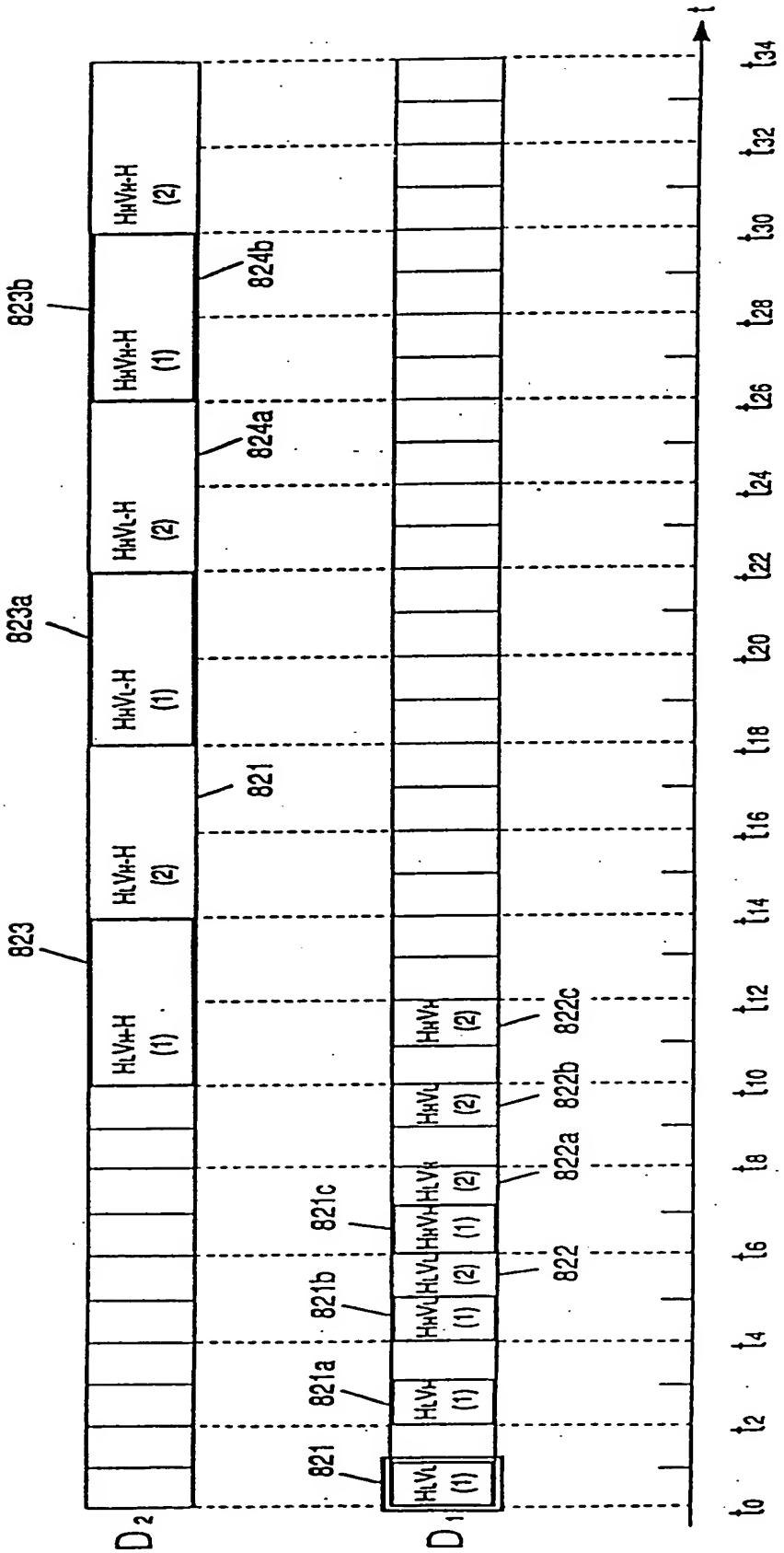

D2
D1
t
t0
t2
t4
t6
t8
t10
t12
t14
t16
t18
t20
t22
t24
t26
t28
t30
t32
t34
823
823a
823b
821
821a
821b
821c
822
822a
822b
822c
824a
824b
HLVH-H (1)
HLVH-H (2)
HHVL-H (1)
HHVL-H (2)
HHVH-H (1)
HHVH-H (2)
HLVL (1)
HLVH (1)
HHVL (1)
HLVL (2)
HLVH (2)
HHVL (2)
HHVH (2)

FIG. 78

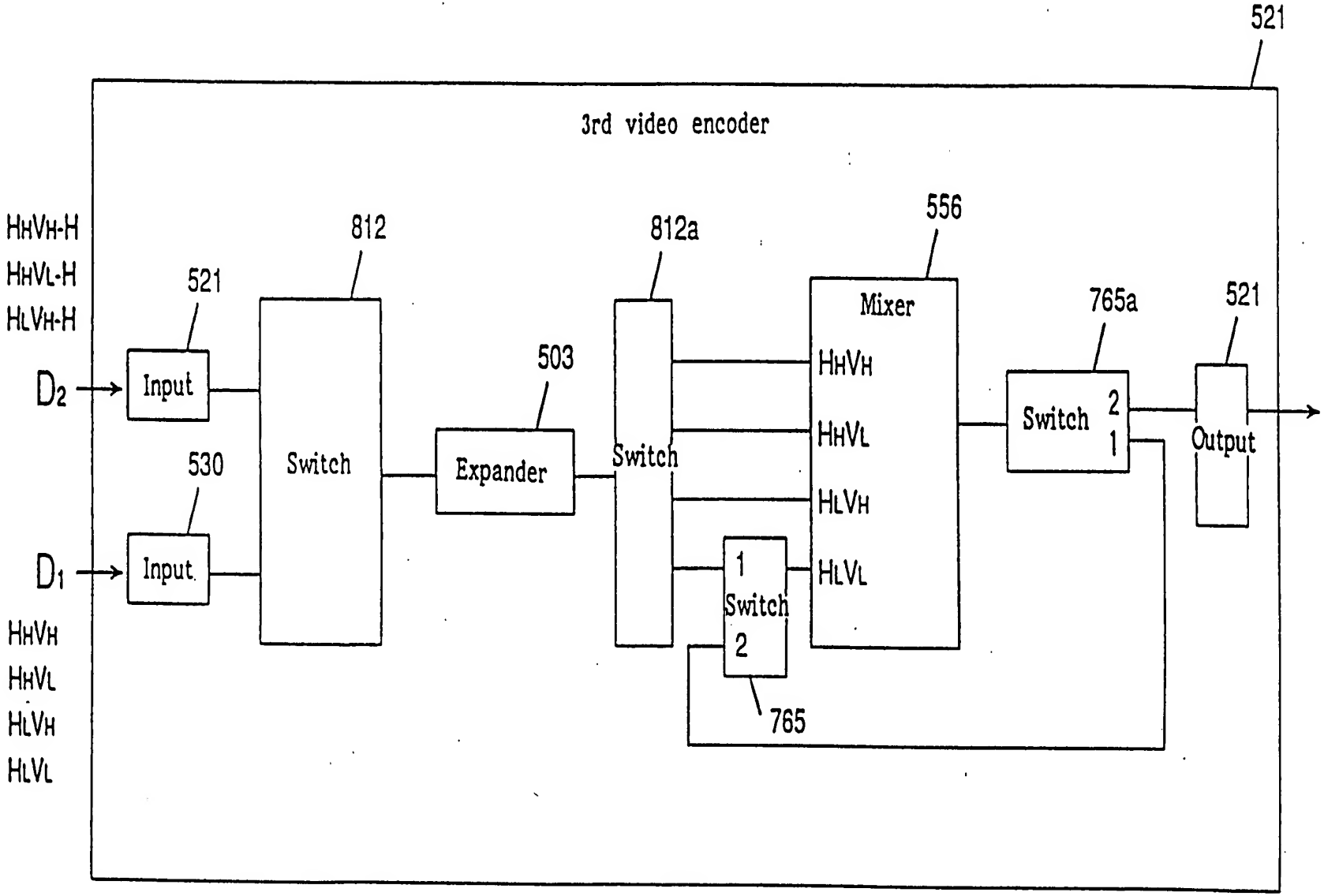

521
3rd video encoder
HHVH-H
HHVL-H
HLVH-H
D2
Input
521
812
Switch
530
D1
Input
HHVH
HHVL
HLVH
HLVL
503
Expander
812a
Switch
556
Mixer
HHVH
HHVL
HLVH
HLVL
1
Switch
2
765
765a
Switch
2
1
521
Output

FIG. 79

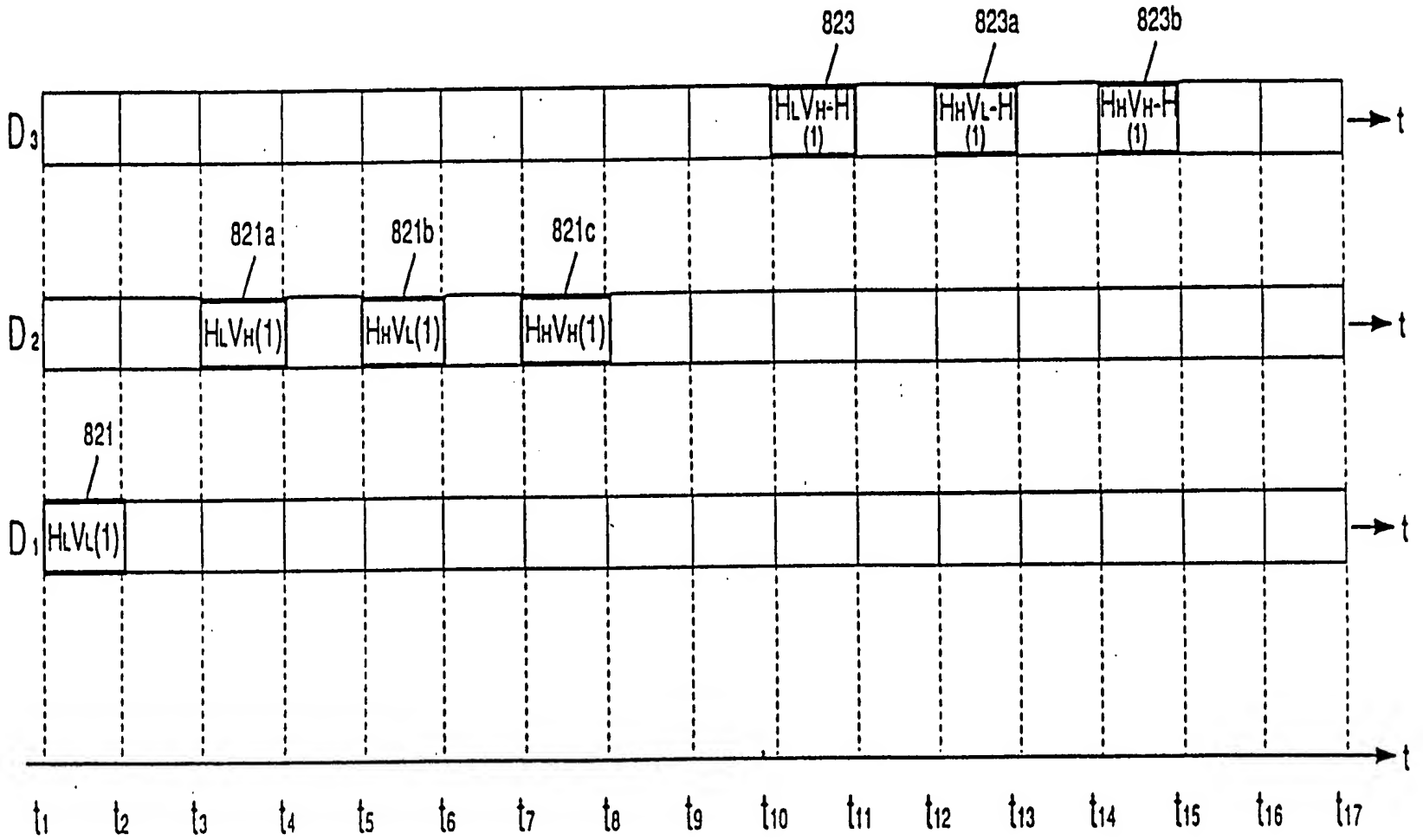

823
823a
823b
D3
HLVH-H (1)
HHVL-H (1)
HHVH-H (1)
t
821a
821b
821c
D2
HLVH(1)
HHVL(1)
HHVH(1)
t
821
D1
HLVL(1)
t
t
t1 t2 t3 t4 t5 t6 t7 t8 t9 t10 t11 t12 t13 t14 t15 t16 t17

FIG. 80

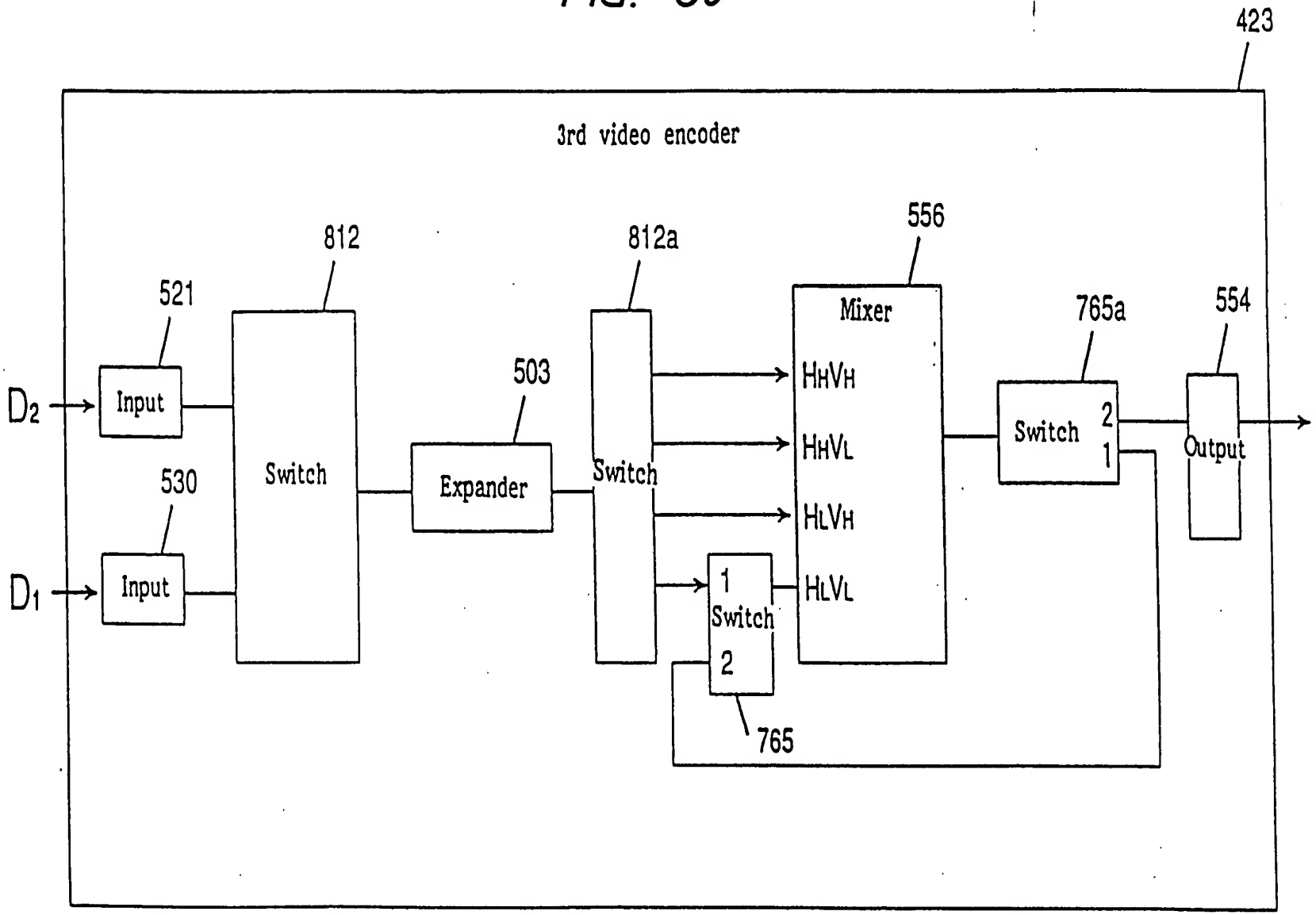

423
3rd video encoder
812
812a
556
521
Mixer
765a
554
503
D2
Input
HHVH
Switch
2
Output
HHVL
530
Switch
Expander
Switch
1
HLVH
D1
Input
1
Switch
HLVL
2
765

FIG. 81

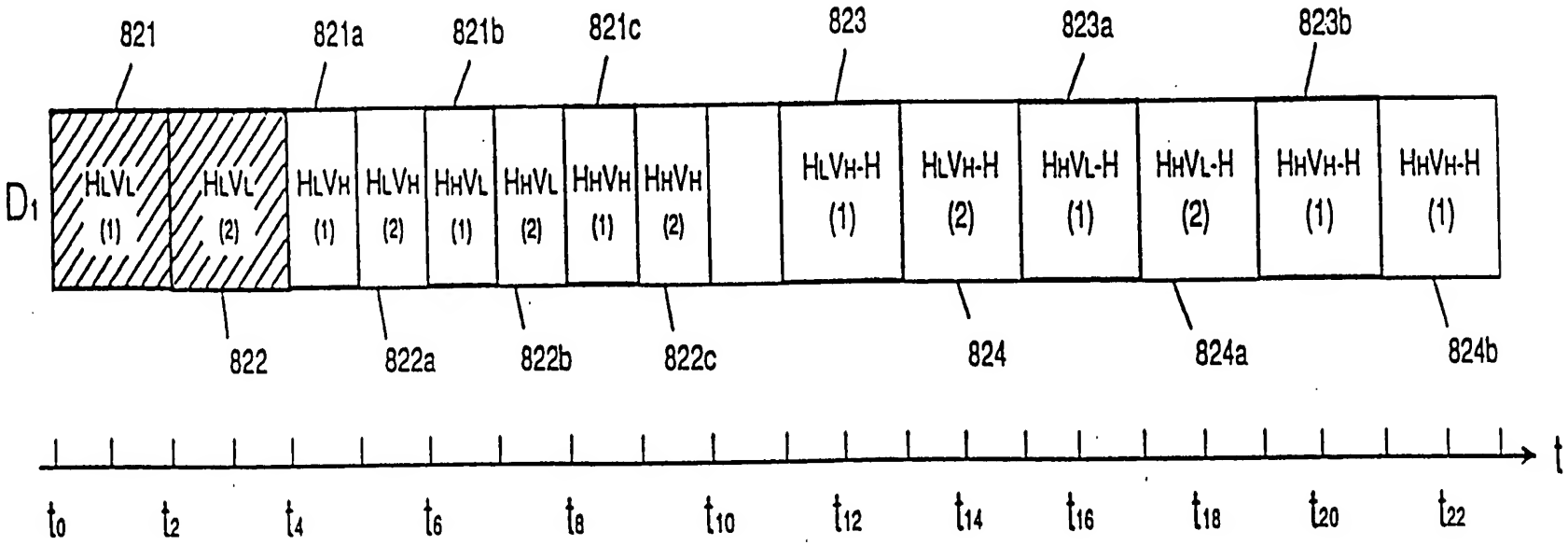

821
821a
821b
821c
823
823a
823b
D1
HLVL (1)
HLVL (2)
HLVH (1)
HLVH (2)
HHVL (1)
HHVL (2)
HHVH (1)
HHVH (2)
HLVH-H (1)
HLVH-H (2)
HHVL-H (1)
HHVL-H (2)
HHVH-H (1)
HHVH-H (1)
822
822a
822b
822c
824
824a
824b
t
t0
t2
t4
t6
t8
t10
t12
t14
t16
t18
t20
t22

FIG. 82

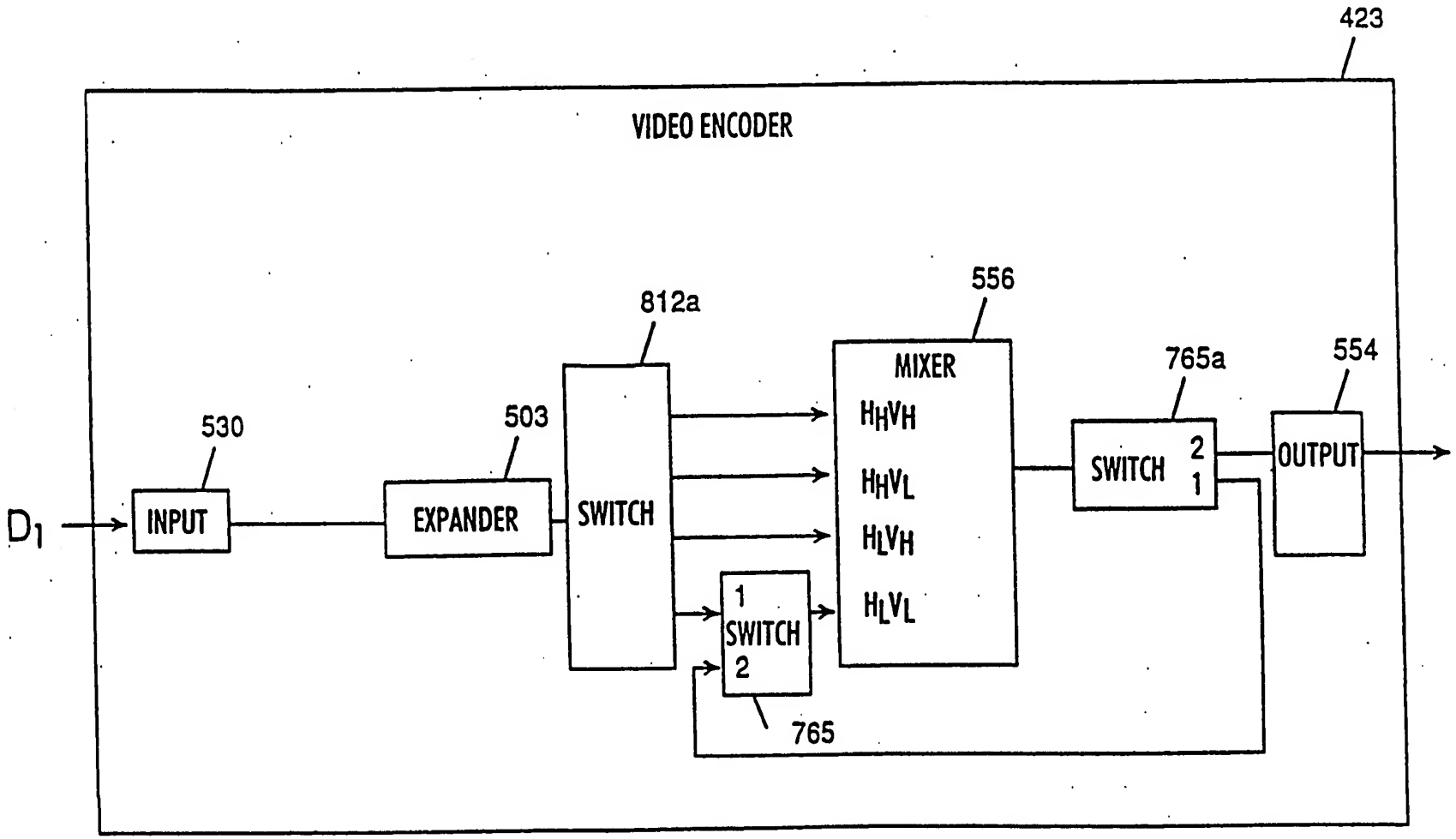

423
VIDEO ENCODER
812a
556
MIXER
765a
554
530
503
D_1
INPUT
EXPANDER
SWITCH
H_HV_H
H_HV_L
H_LV_H
H_LV_L
SWITCH 2 1
OUTPUT
1
SWITCH
2
765

FIG. 83

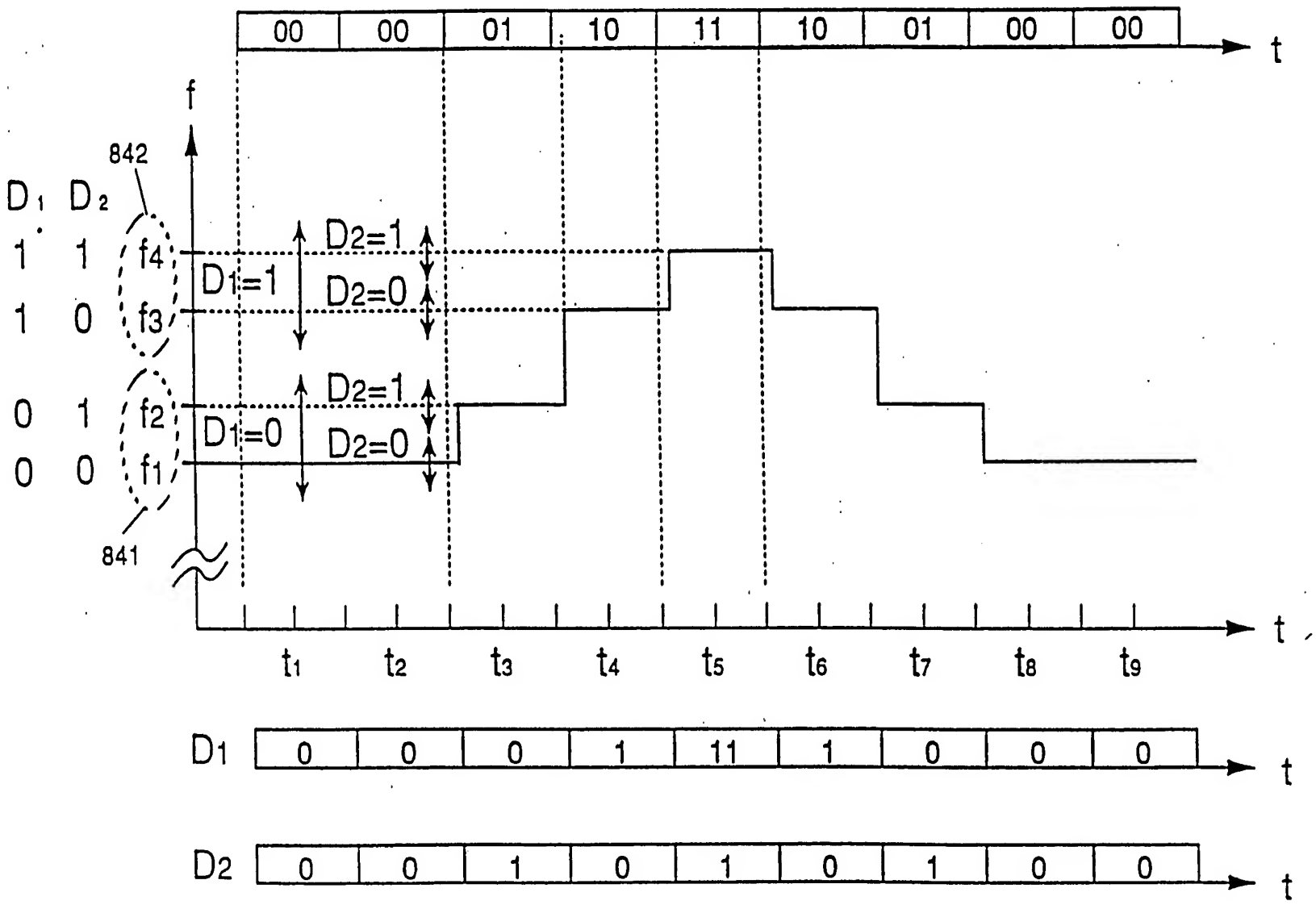

00 00 01 10 11 10 01 00 00
t
f
842
D1 D2
1 1 f4
1 0 f3
0 1 f2
0 0 f1
841
D1=1
D1=0
D2=1
D2=0
D2=1
D2=0
t
t1 t2 t3 t4 t5 t6 t7 t8 t9
D1
0 0 0 1 11 1 0 0 0
t
D2
0 0 1 0 1 0 1 0 0
t

FIG. 84

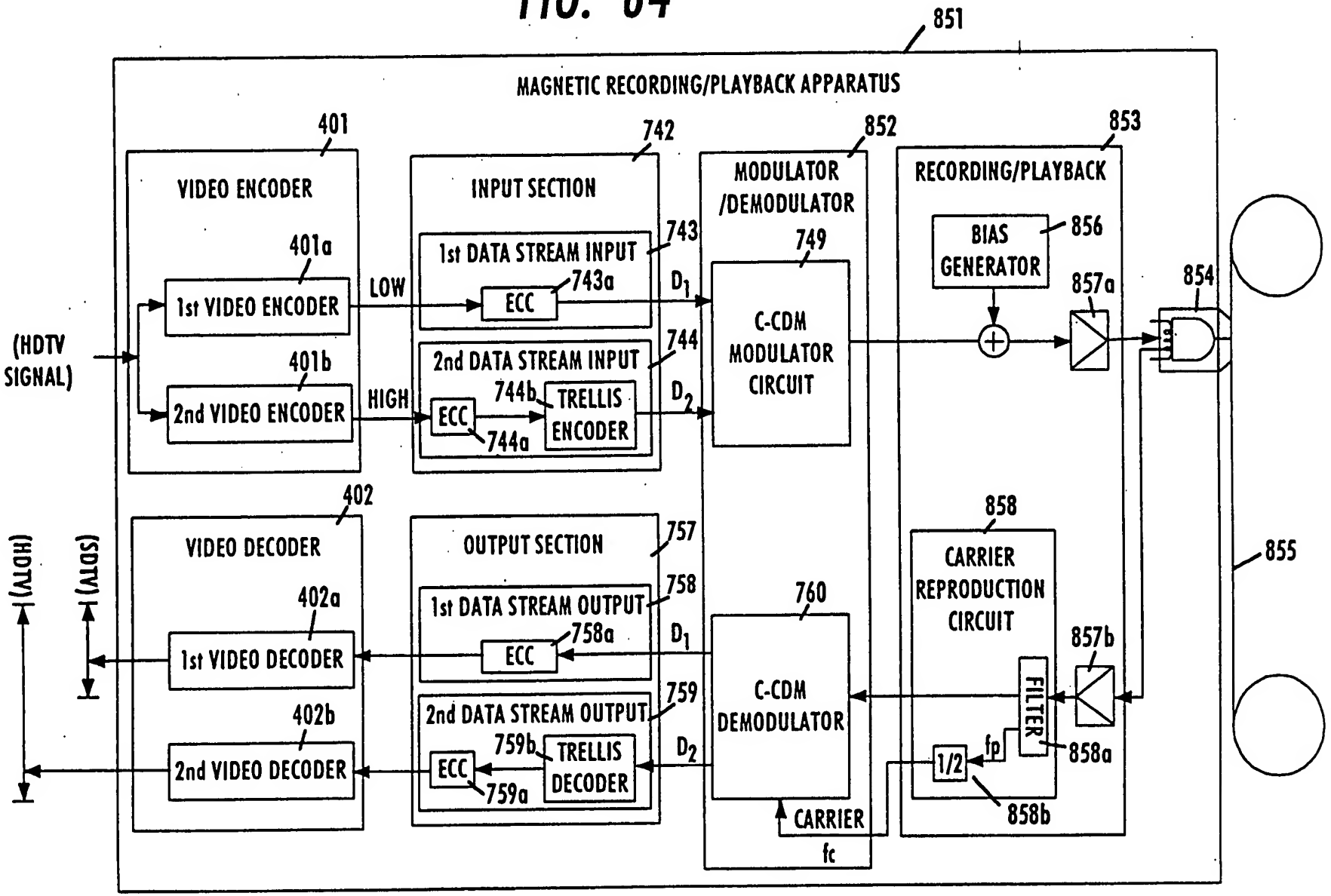

851
MAGNETIC RECORDING/PLAYBACK APPARATUS
401
VIDEO ENCODER
401a
1st VIDEO ENCODER
401b
2nd VIDEO ENCODER
(HDTV SIGNAL)
LOW
HIGH
742
INPUT SECTION
743
1st DATA STREAM INPUT
743a
ECC
744
2nd DATA STREAM INPUT
744b
TRELLIS ENCODER
744a
ECC
D1
D2
852
MODULATOR /DEMODULATOR
749
C-CDM MODULATOR CIRCUIT
853
RECORDING/PLAYBACK
BIAS GENERATOR
856
857a
854
855
858
CARRIER REPRODUCTION CIRCUIT
857b
FILTER
858a
1/2
fp
858b
760
C-CDM DEMODULATOR
CARRIER
fc
402
VIDEO DECODER
402a
1st VIDEO DECODER
402b
2nd VIDEO DECODER
(SDTV)
(HDTV)
757
OUTPUT SECTION
758
1st DATA STREAM OUTPUT
758a
ECC
759
2nd DATA STREAM OUTPUT
759b
TRELLIS DECODER
759a
ECC
D1
D2

FIG. 85

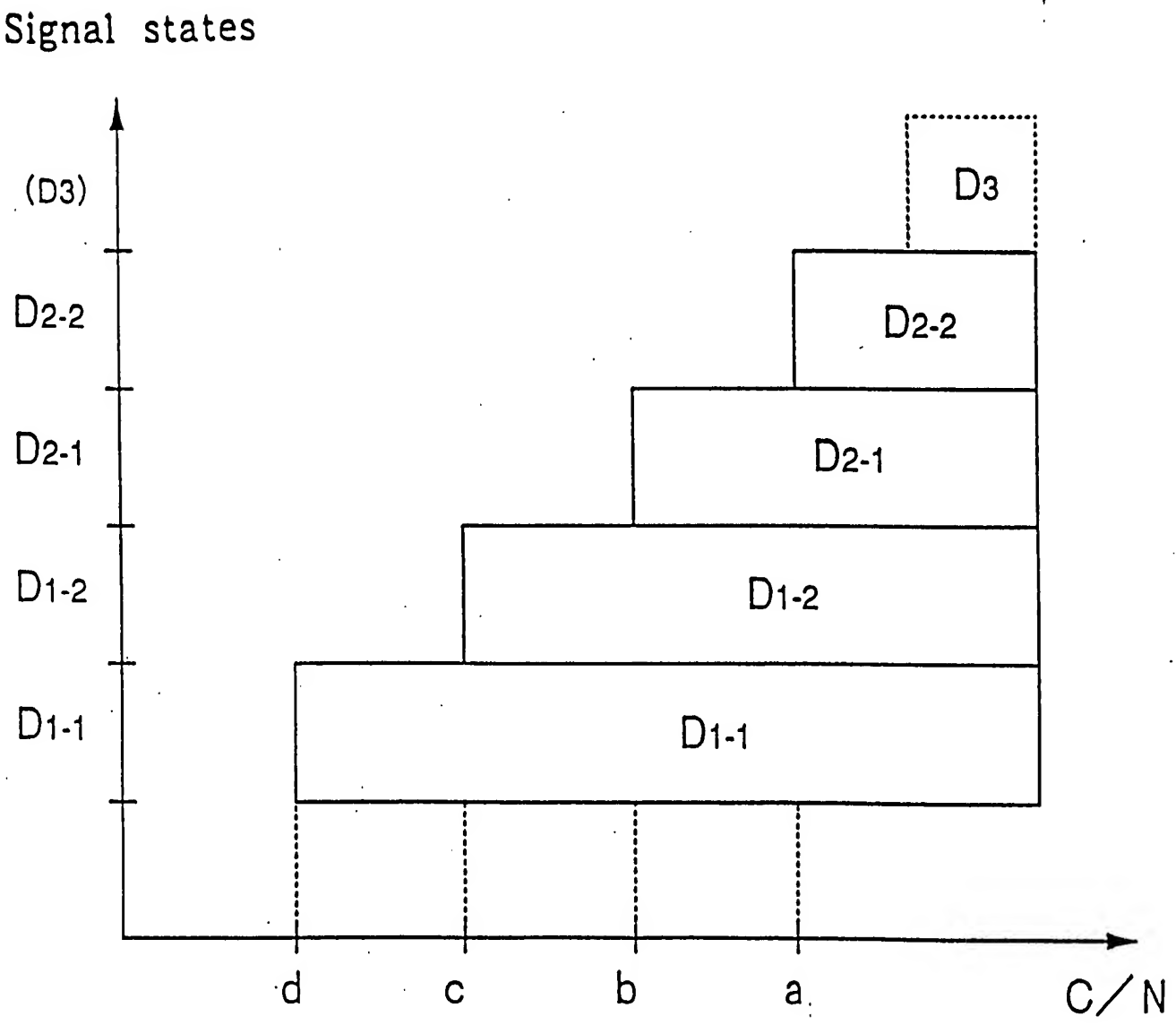


FIG. 86

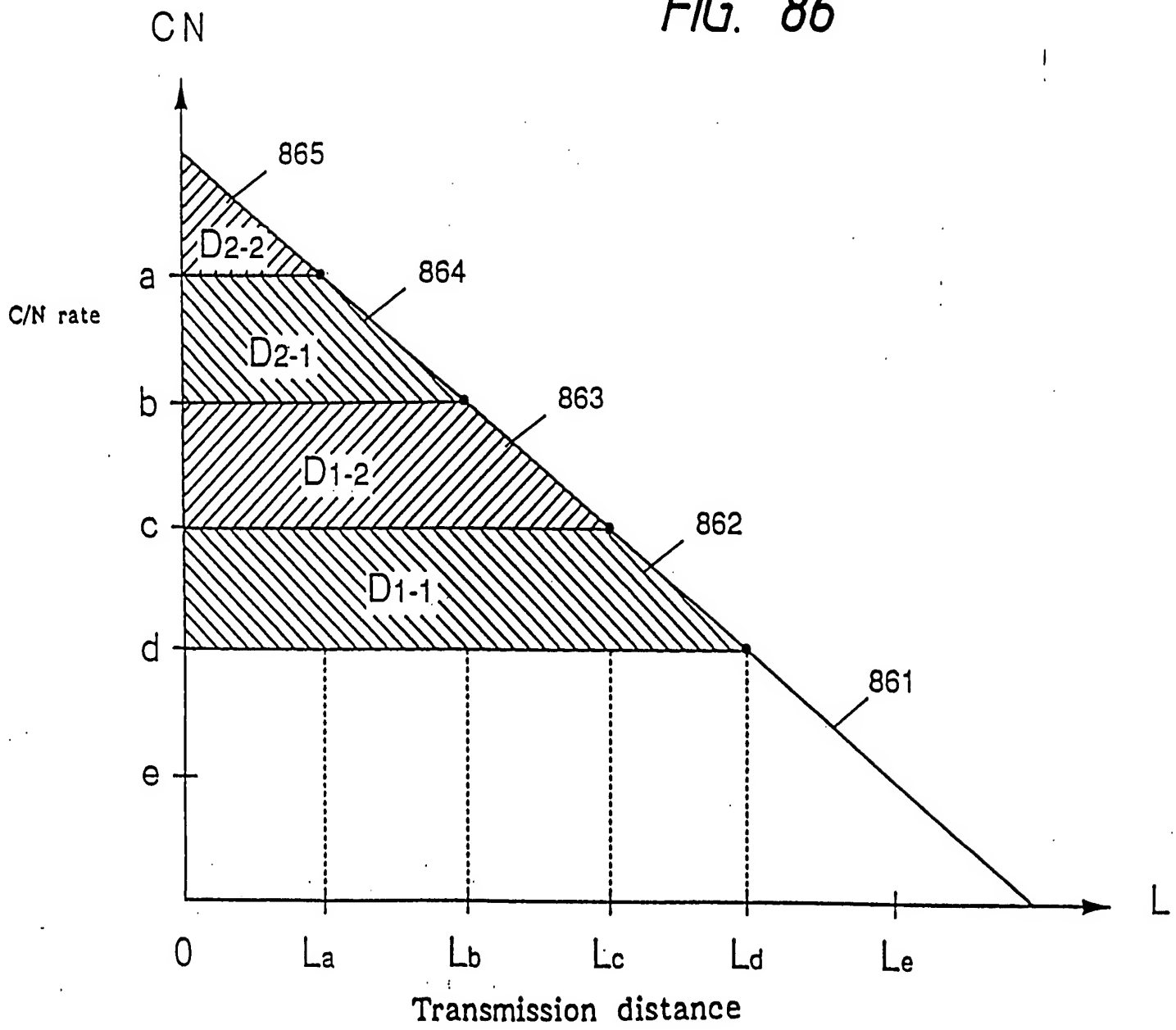

CN
C/N rate
a
b
c
d
e
865
D2-2
864
D2-1
863
D1-2
862
D1-1
861
L
0
La
Lb
Lc
Ld
Le
Transmission distance

FIG. 87

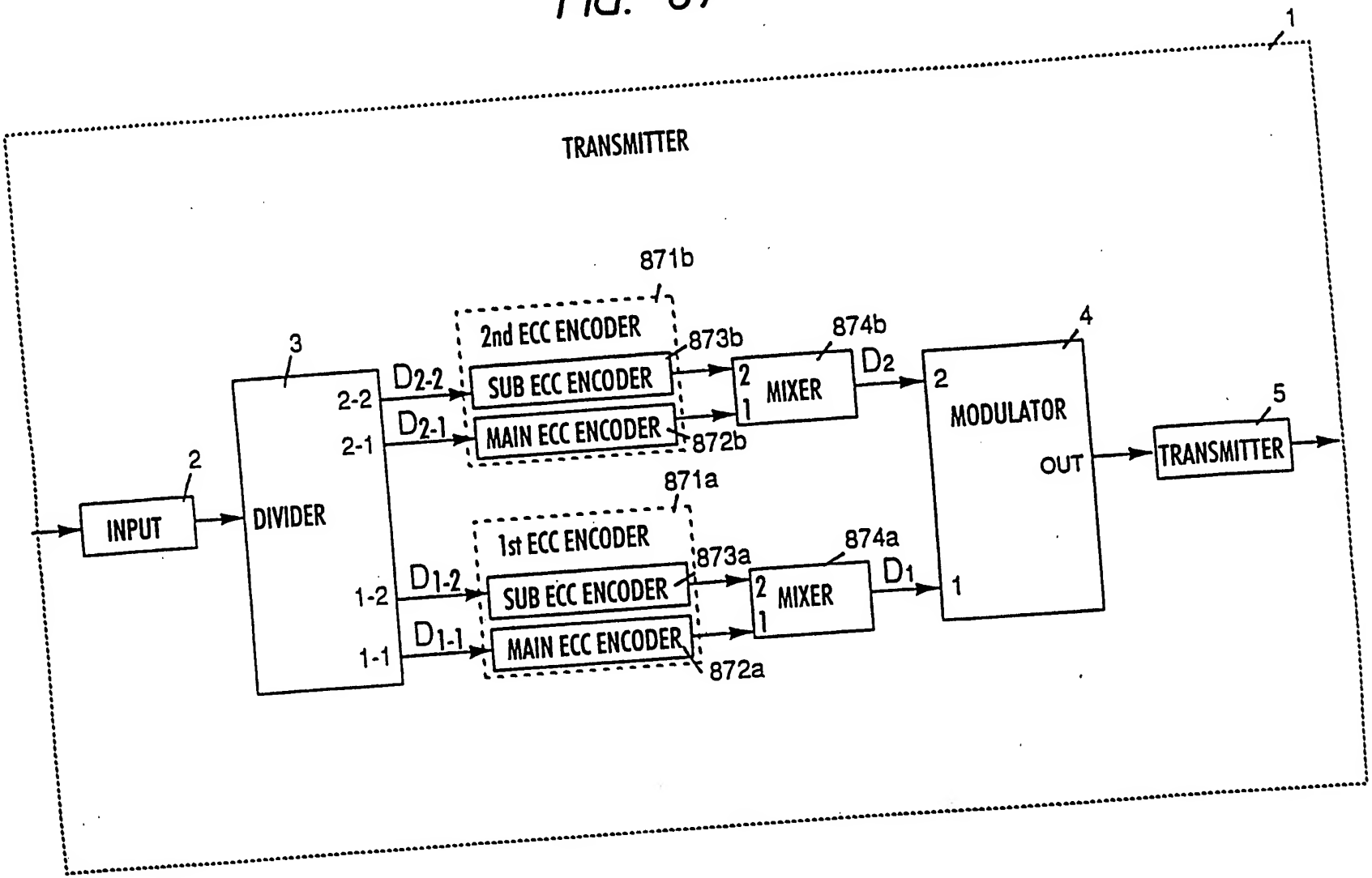

1
TRANSMITTER
871b
2nd ECC ENCODER
873b
874b
4
3
2-2
D2-2
SUB ECC ENCODER
2
MIXER
D2
2
MODULATOR
5
2-1
D2-1
MAIN ECC ENCODER
1
872b
OUT
TRANSMITTER
2
INPUT
DIVIDER
871a
1st ECC ENCODER
873a
874a
1-2
D1-2
SUB ECC ENCODER
2
MIXER
D1
1
1-1
D1-1
MAIN ECC ENCODER
1
872a

FIG. 88

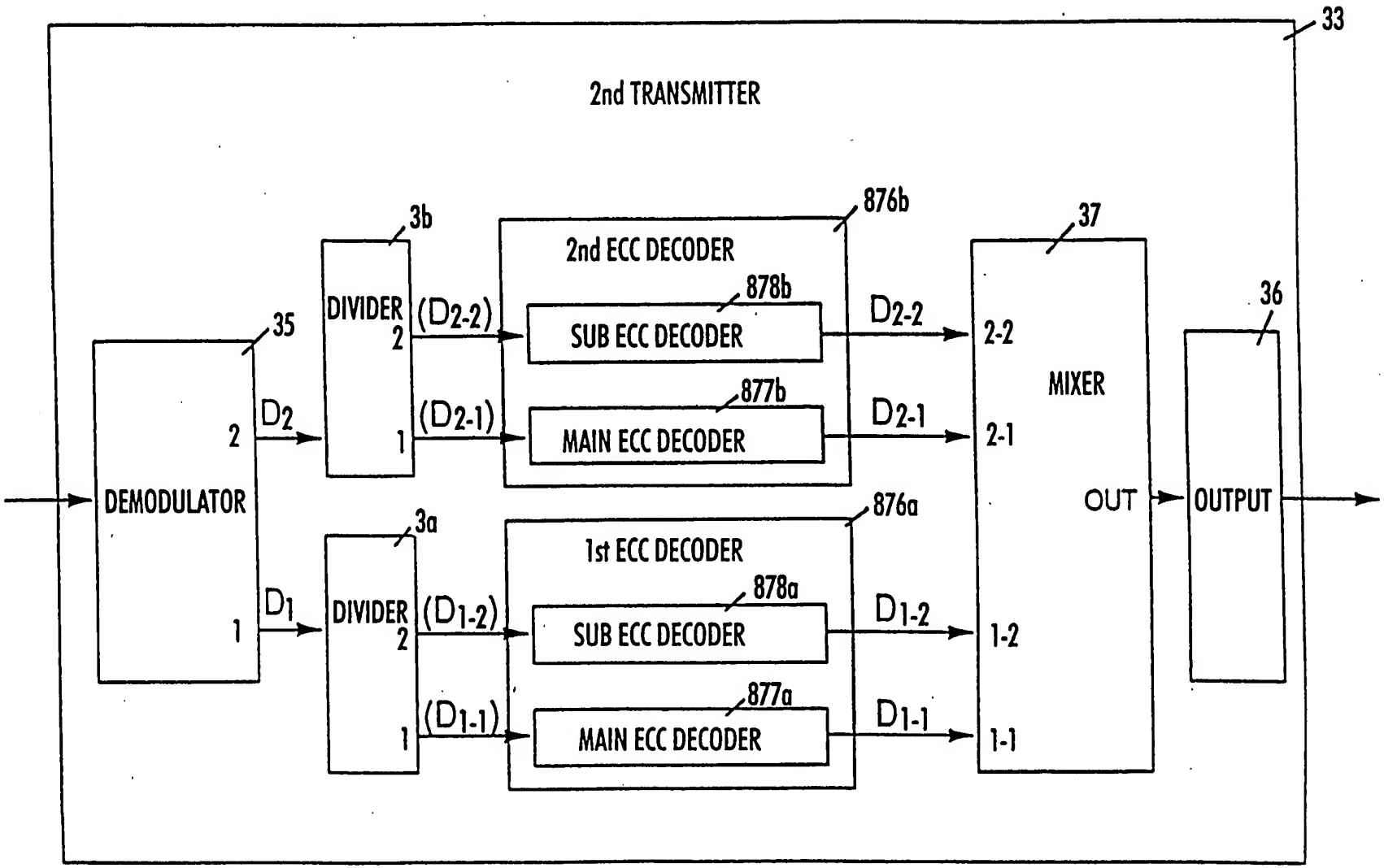
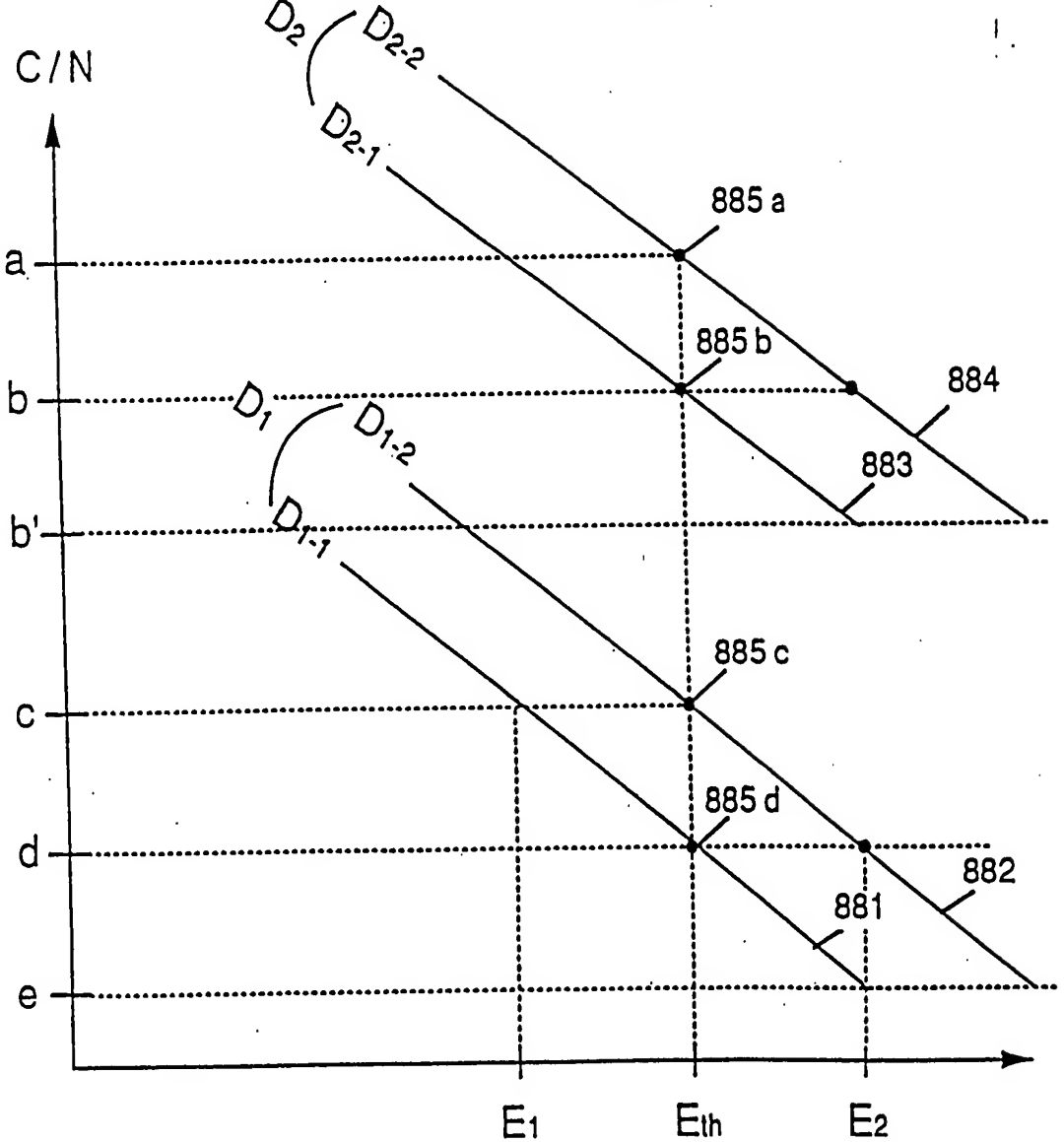

33
2nd TRANSMITTER
DEMODULATOR
35
2
1
D2
D1
DIVIDER
3b
2
1
(D2-2)
(D2-1)
DIVIDER
3a
2
1
(D1-2)
(D1-1)
2nd ECC DECODER
876b
878b
SUB ECC DECODER
877b
MAIN ECC DECODER
1st ECC DECODER
876a
878a
SUB ECC DECODER
877a
MAIN ECC DECODER
D2-2
D2-1
D1-2
D1-1
MIXER
37
2-2
2-1
1-2
1-1
OUT
OUTPUT
36

FIG. 89



Error rate after error correction

FIG. 90

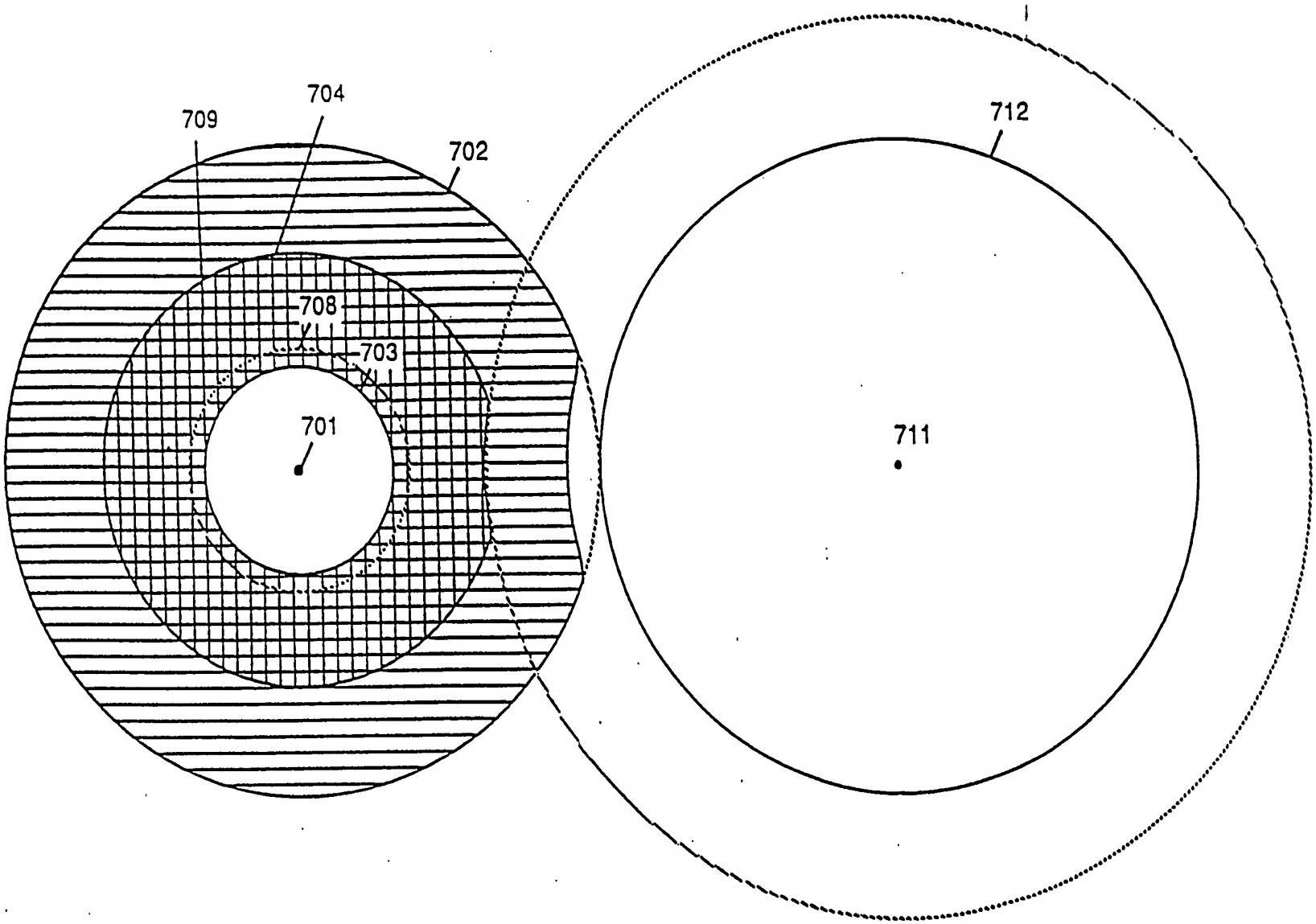


FIG. 91

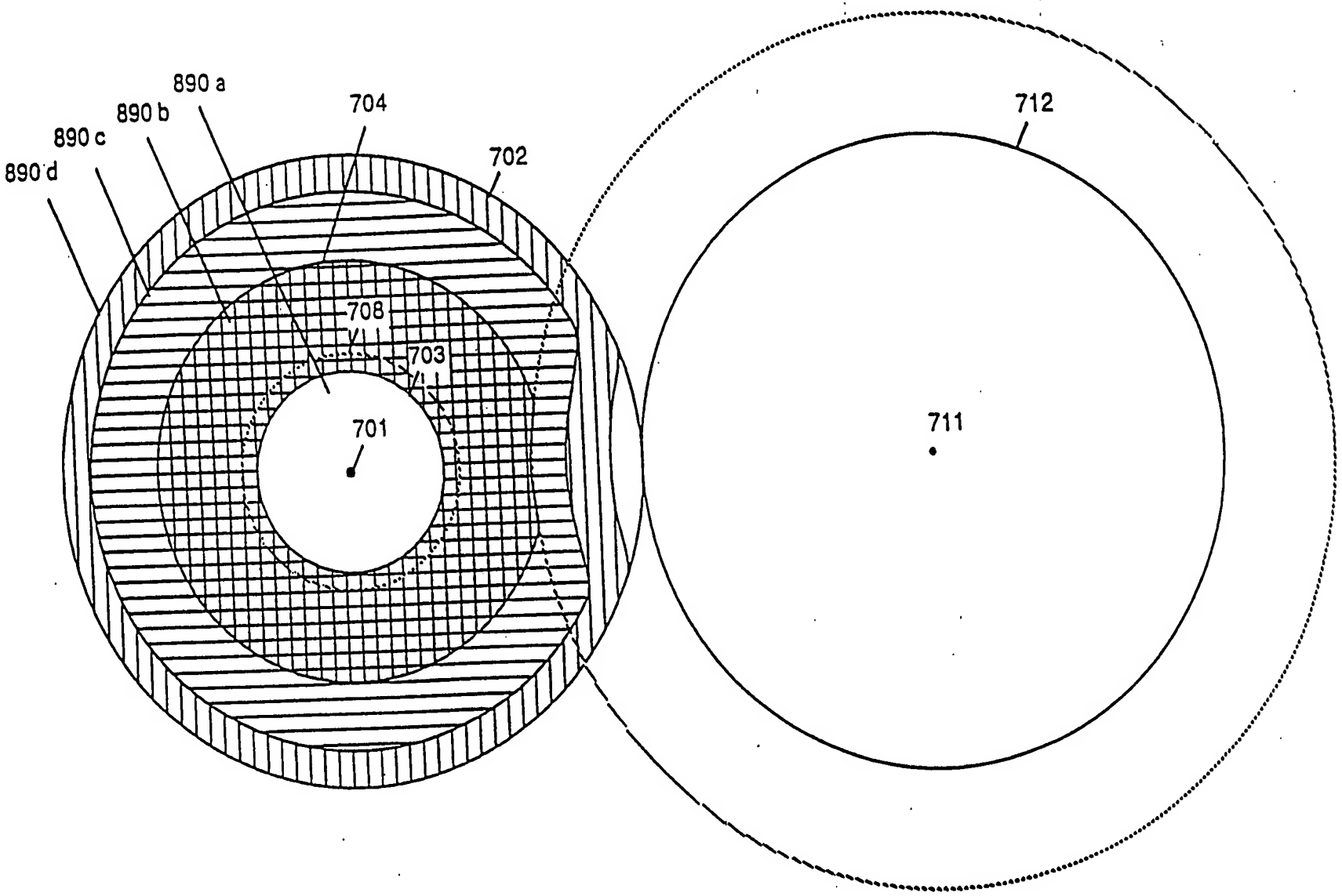


FIG. 92

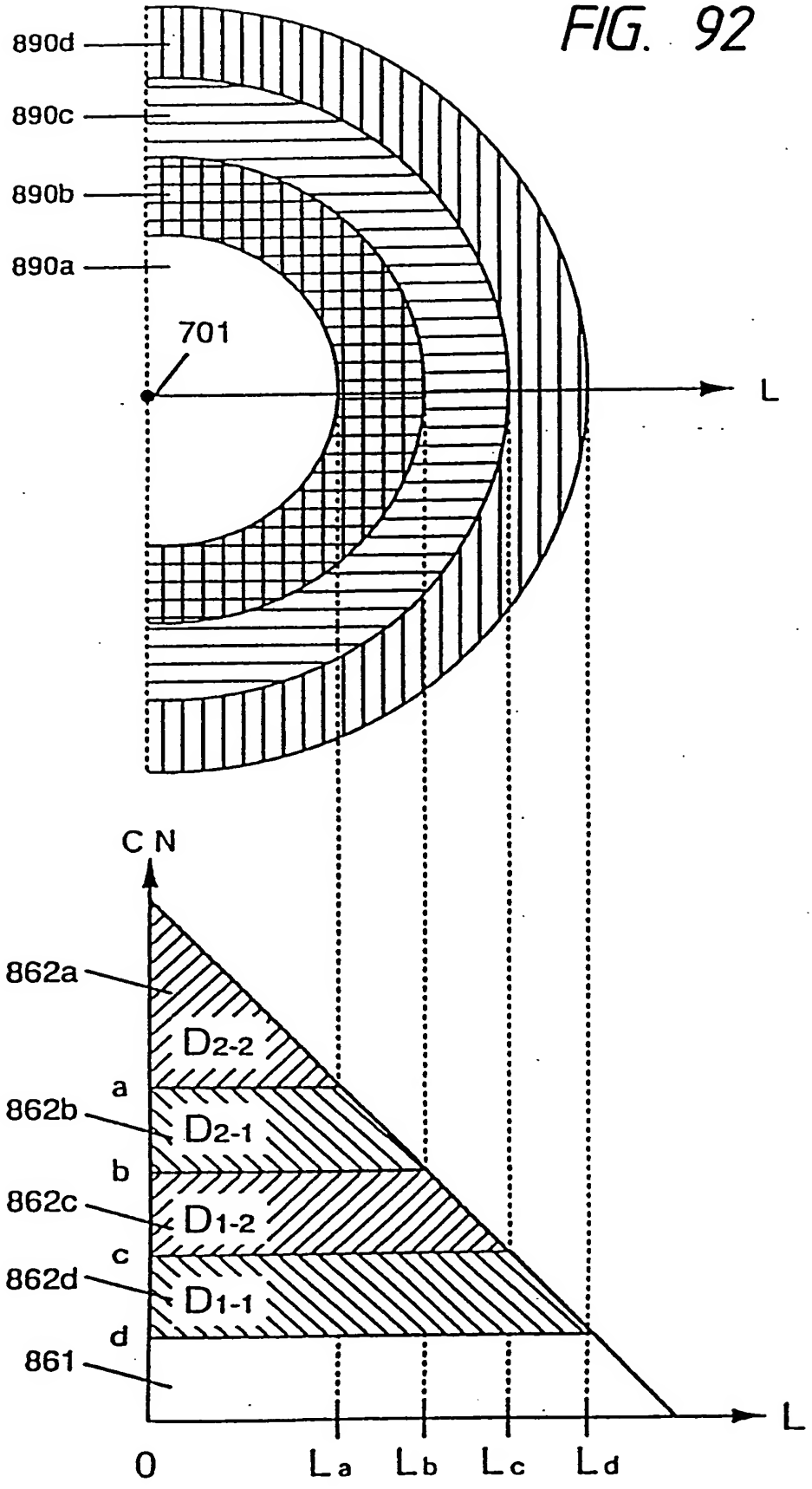

890d
890c
890b
890a
701
L
C N
862a
D2-2
a
862b
D2-1
b
862c
D1-2
c
862d
D1-1
d
861
L
0
La
Lb
Lc
Ld

FIG. 93

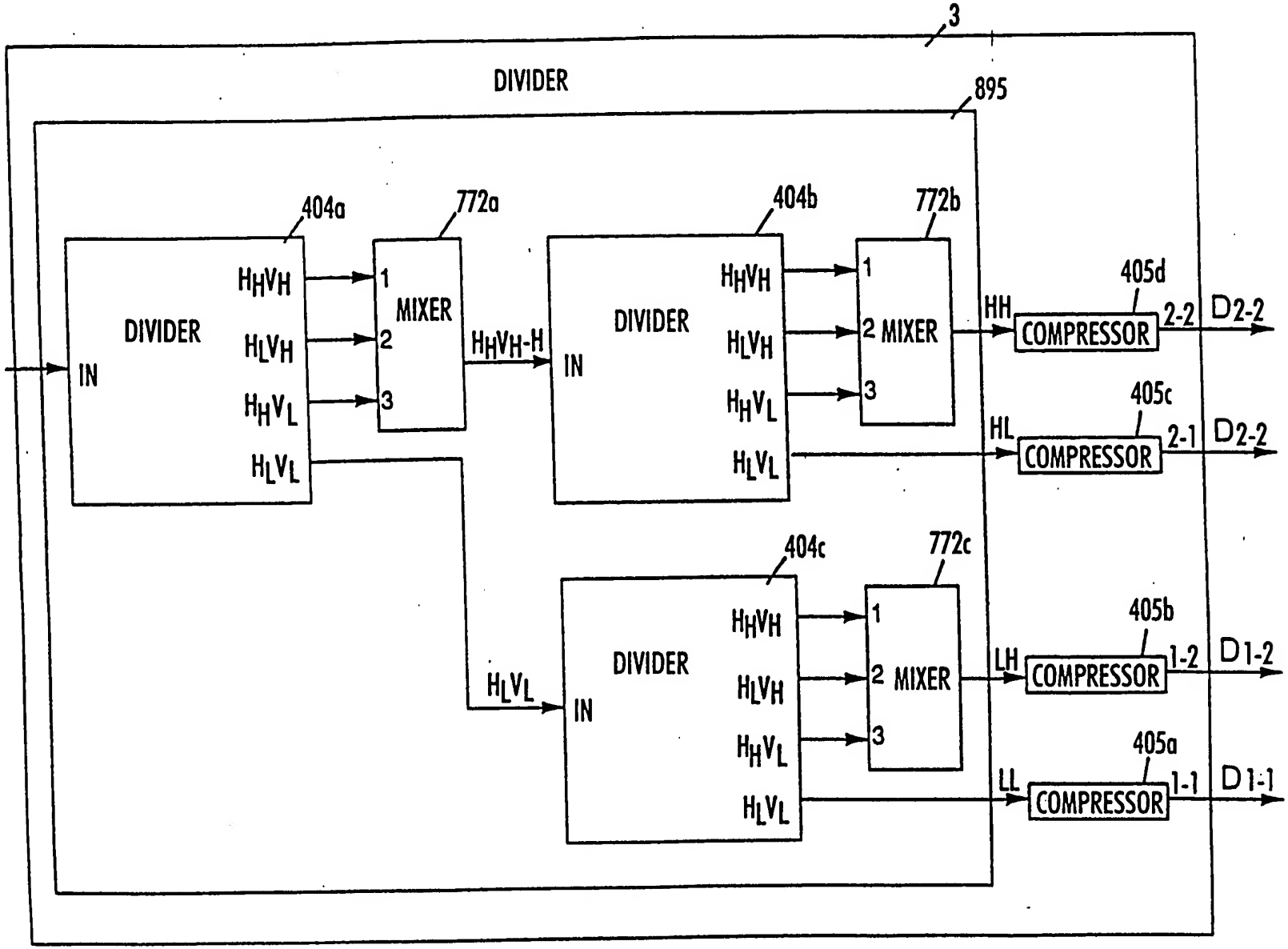

3
DIVIDER
895
404a
772a
404b
772b
405d
405c
405b
405a
DIVIDER
IN
H_HV_H
H_LV_H
H_HV_L
H_LV_L
1
2
3
MIXER
H_HV_H-H
HH
HL
LH
LL
COMPRESSOR
2-2
2-1
1-2
1-1
D2-2
D2-2
D1-2
D1-1
404c
772c

FIG. 94

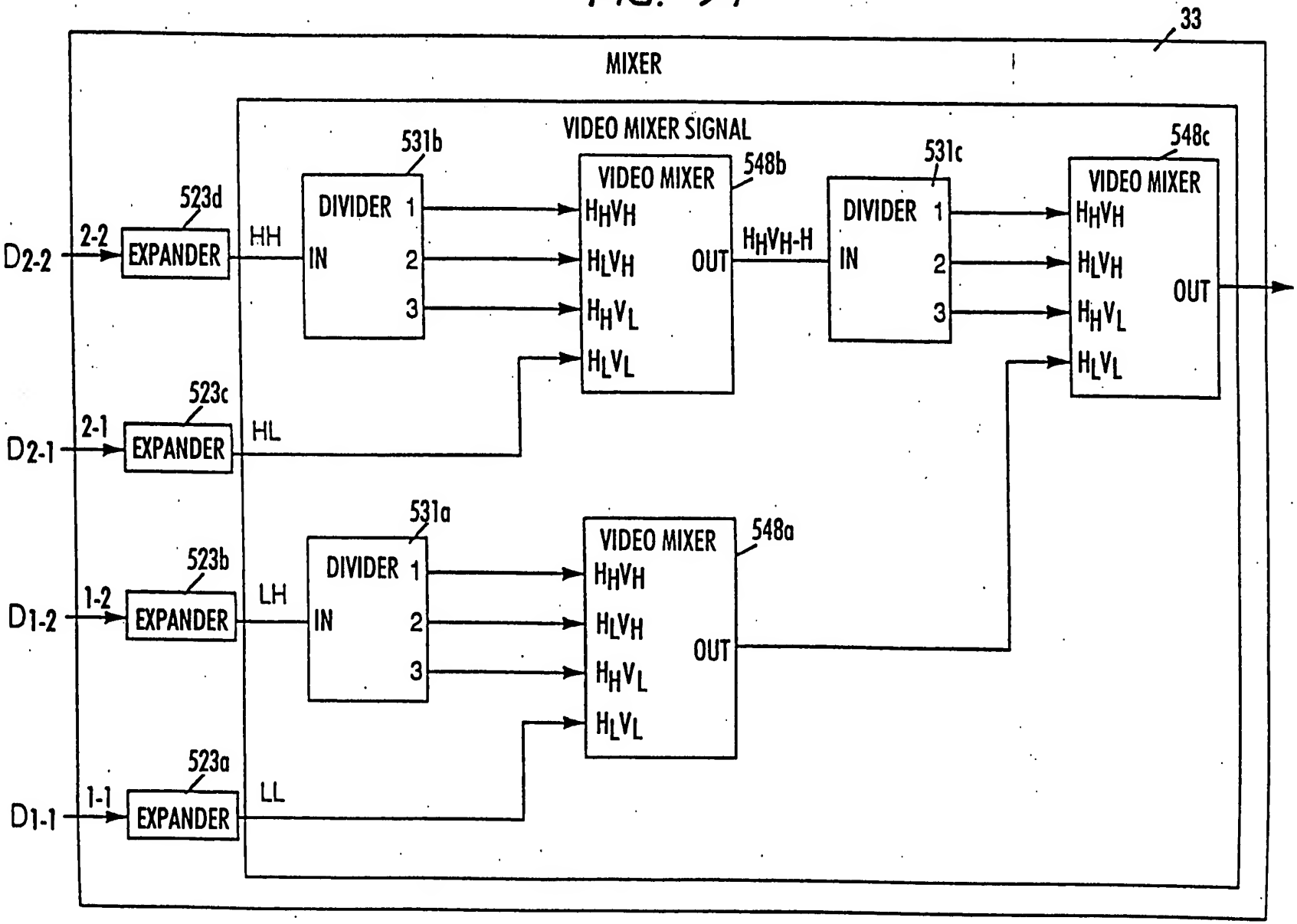

33
MIXER
VIDEO MIXER SIGNAL
D2-2
2-2
523d
EXPANDER
HH
531b
DIVIDER
IN
1
2
3
VIDEO MIXER
548b
HHVH
HLVH
HHVL
HLVL
OUT
HHVH-H
531c
DIVIDER
IN
1
2
3
548c
VIDEO MIXER
HHVH
HLVH
HHVL
HLVL
OUT
D2-1
2-1
523c
EXPANDER
HL
D1-2
1-2
523b
EXPANDER
LH
531a
DIVIDER
IN
1
2
3
VIDEO MIXER
548a
HHVH
HLVH
HHVL
HLVL
OUT
D1-1
1-1
523a
EXPANDER
LL

FIG. 95

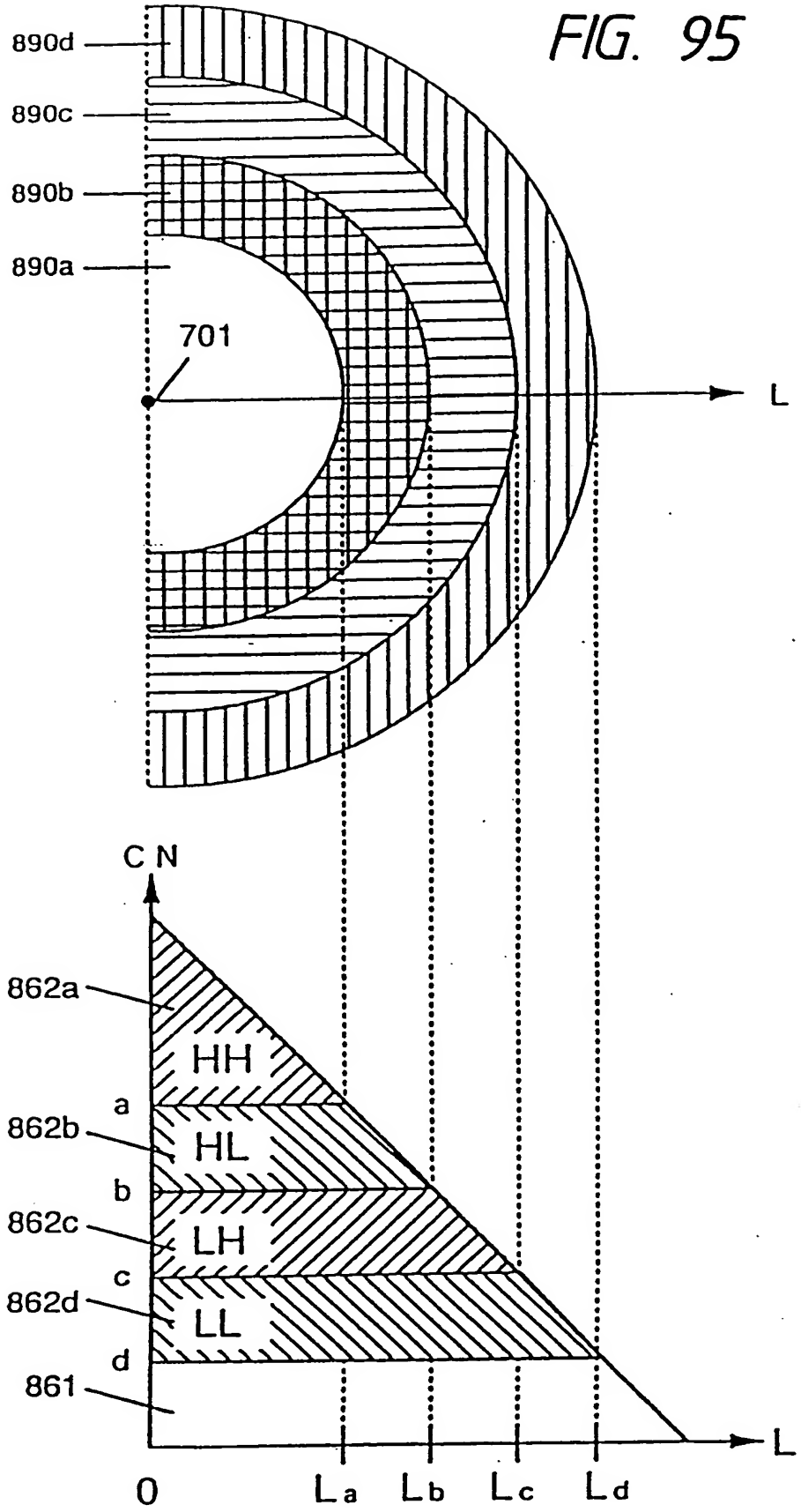

890d
890c
890b
890a
701
L
C N
862a
HH
a
862b
HL
b
862c
LH
c
862d
LL
d
861
L
0
La
Lb
Lc
Ld

FIG. 96

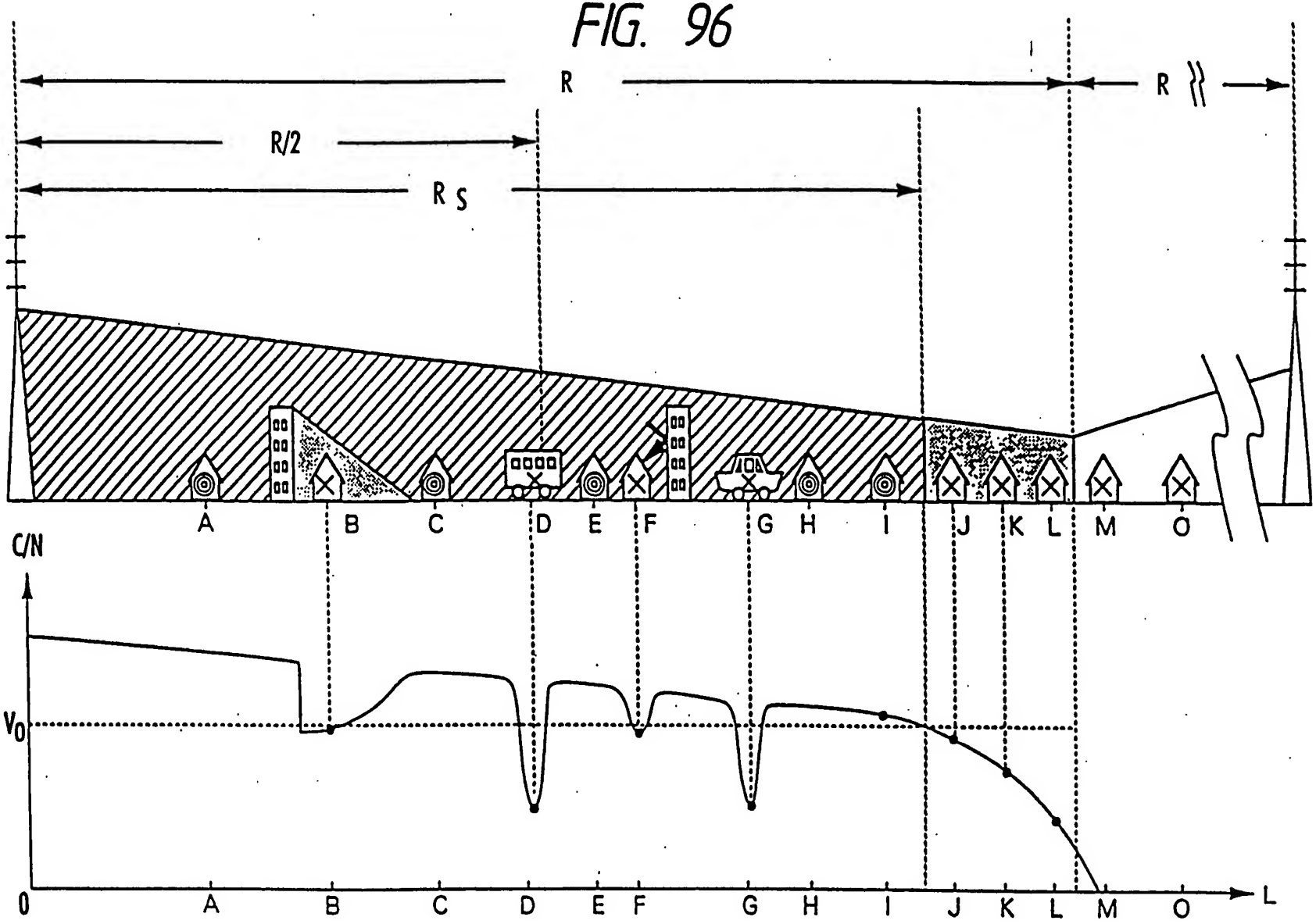


FIG. 97

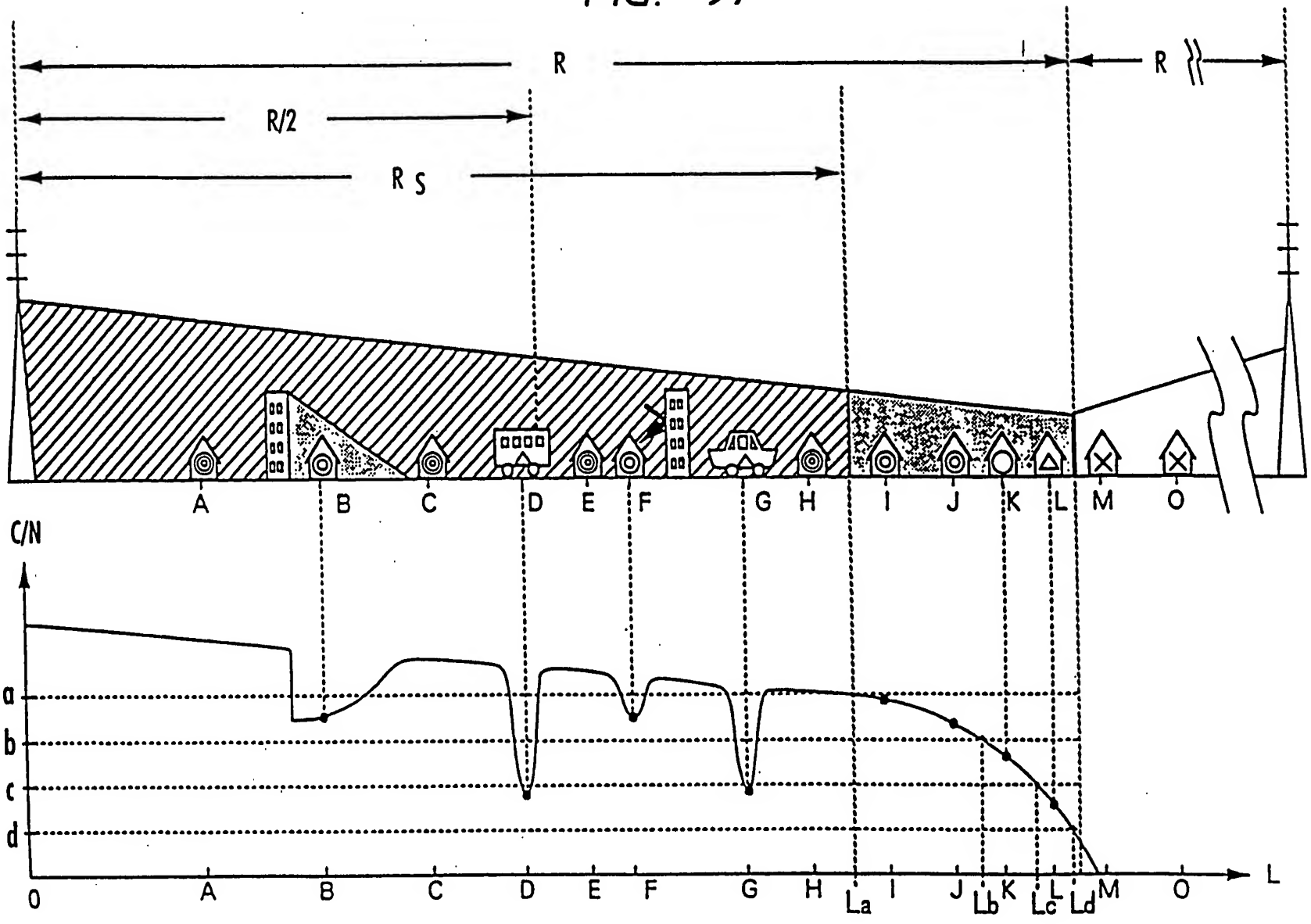

R
R
R/2
R S
A
B
C
D
E
F
G
H
I
J
K
L
M
O
C/N
a
b
c
d
0
A
B
C
D
E
F
G
H
La
I
J
Lb
K
Lc
L
Ld
M
O
L

FIG. 98

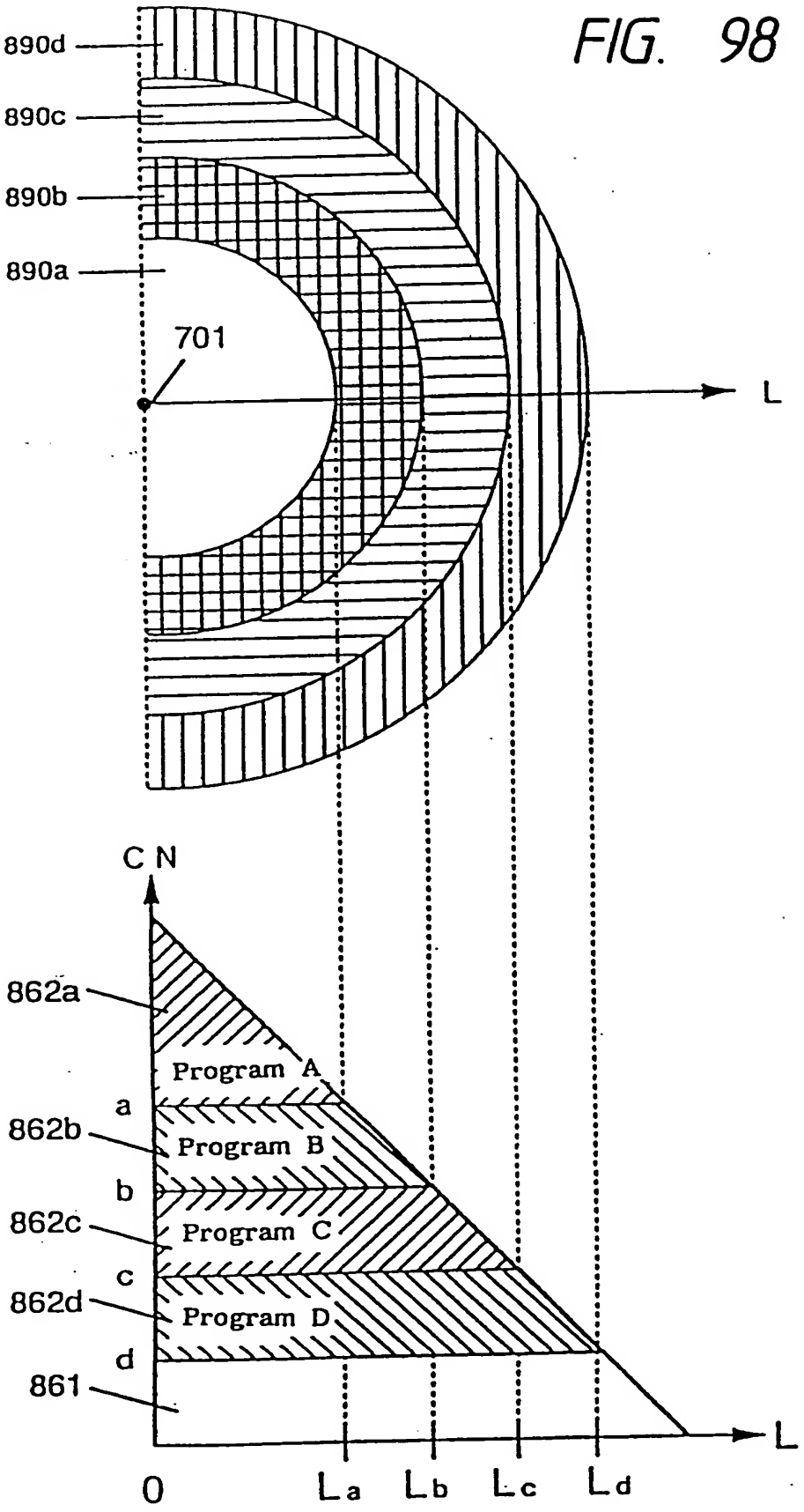

890d
890c
890b
890a
701
L
C N
862a
Program A
a
862b
Program B
b
862c
Program C
c
862d
Program D
d
861
L
0
La
Lb
Lc
Ld

FIG. 99

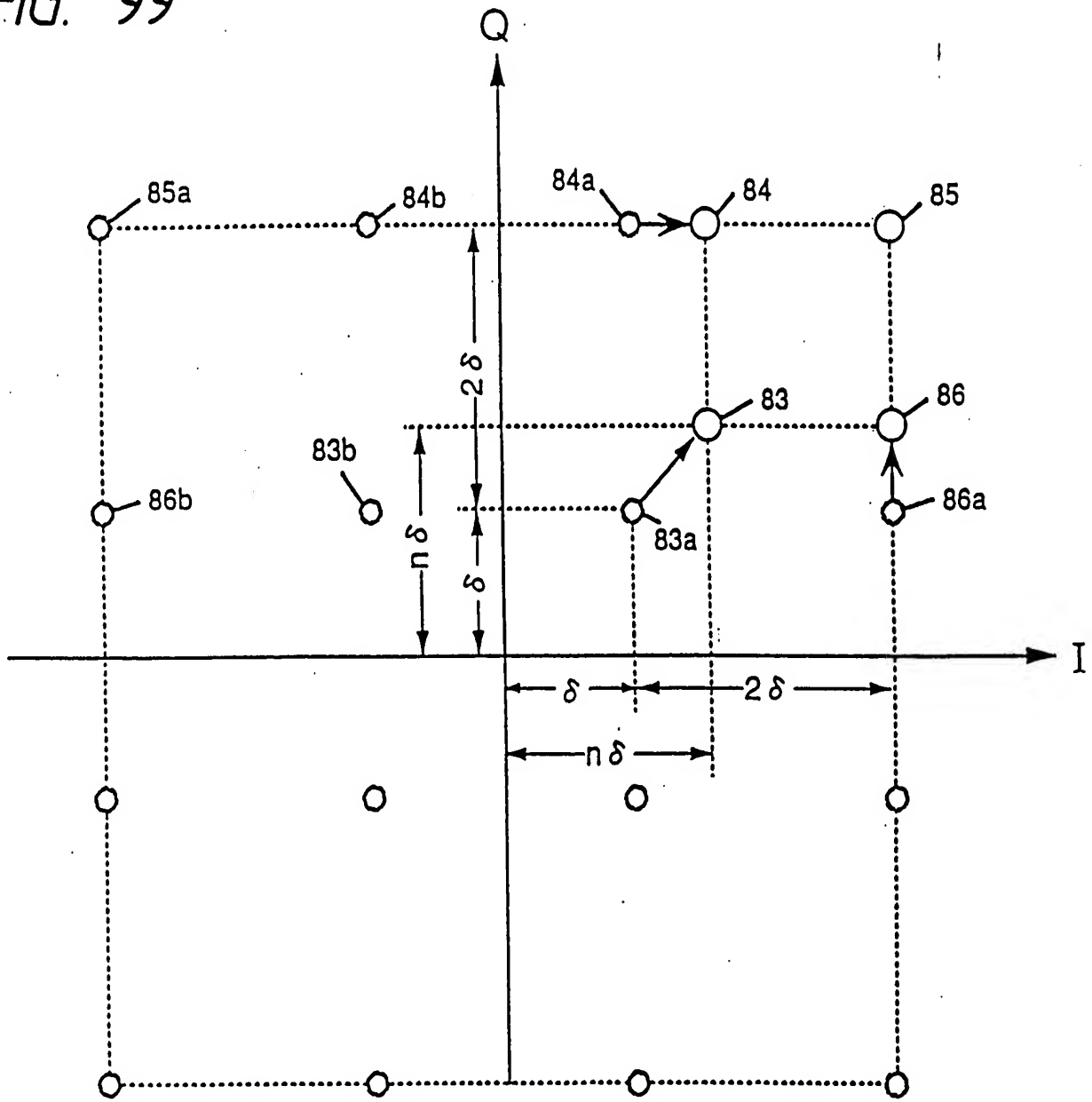


FIG. 100

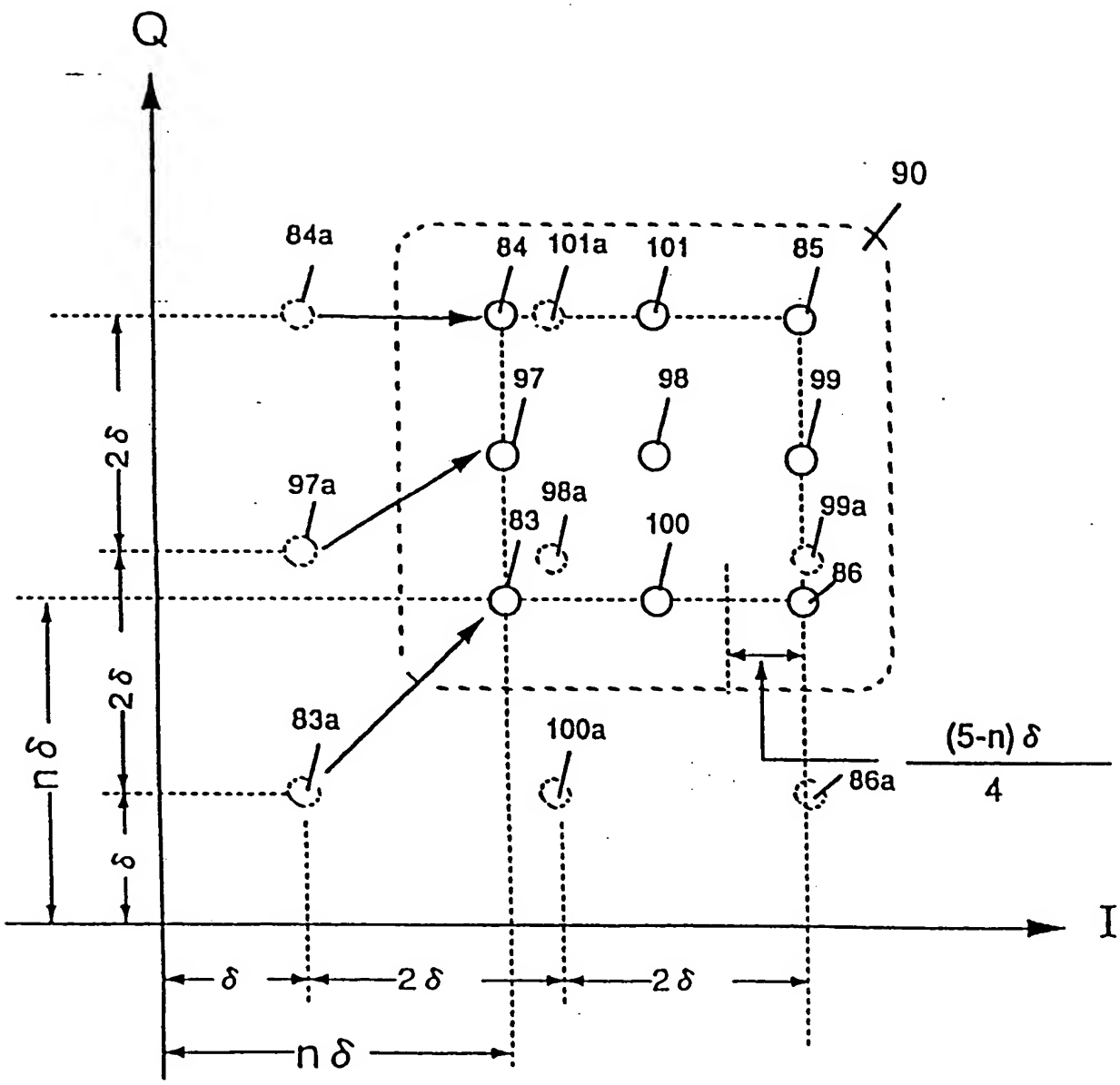

Q
I
90
84a
84
101a
101
85
97
98
99
97a
98a
99a
83
100
86
83a
100a
86a
2δ
2δ
nδ
δ
δ
2δ
2δ
nδ
(5-n) δ
4

FIG. 101

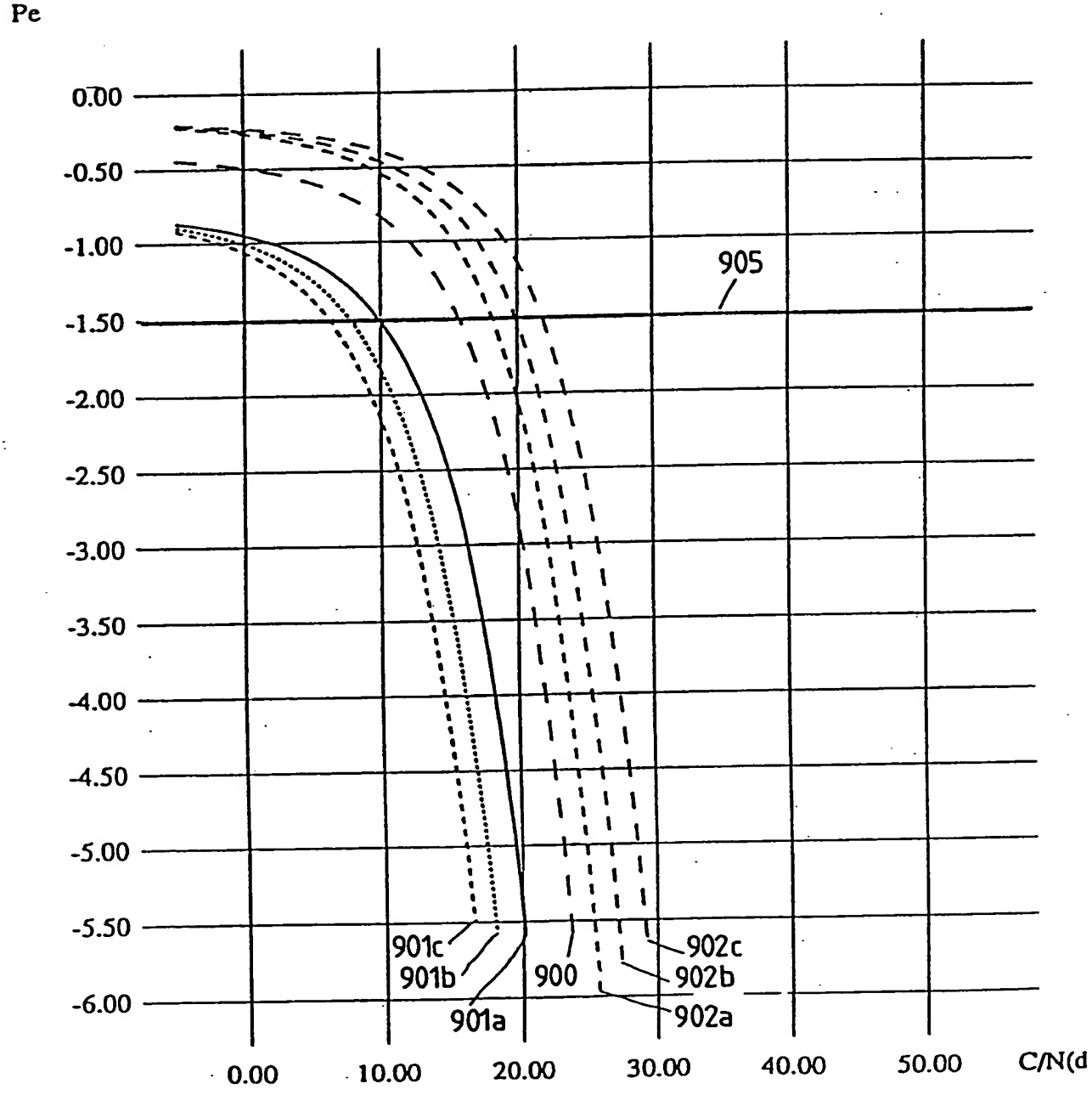

Pe
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00
-4.50
-5.00
-5.50
-6.00
905
901c
901b
901a
900
902c
902b
902a
0.00
10.00
20.00
30.00
40.00
50.00
C/N(d

FIG. 102

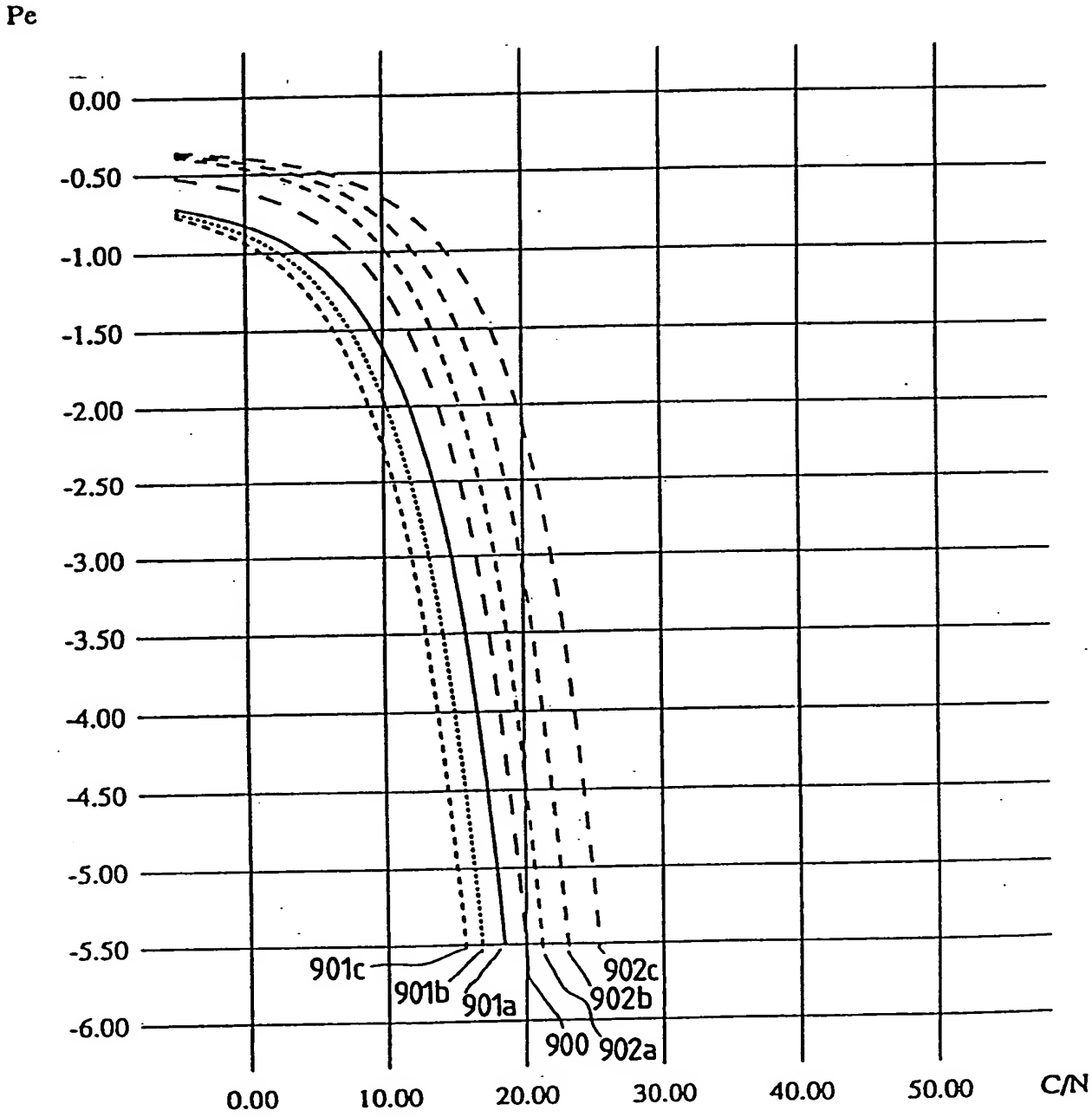

Pe
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00
-4.50
-5.00
-5.50
-6.00
0.00
10.00
20.00
30.00
40.00
50.00
C/N
901c
901b
901a
900
902a
902b
902c

FIG. 103

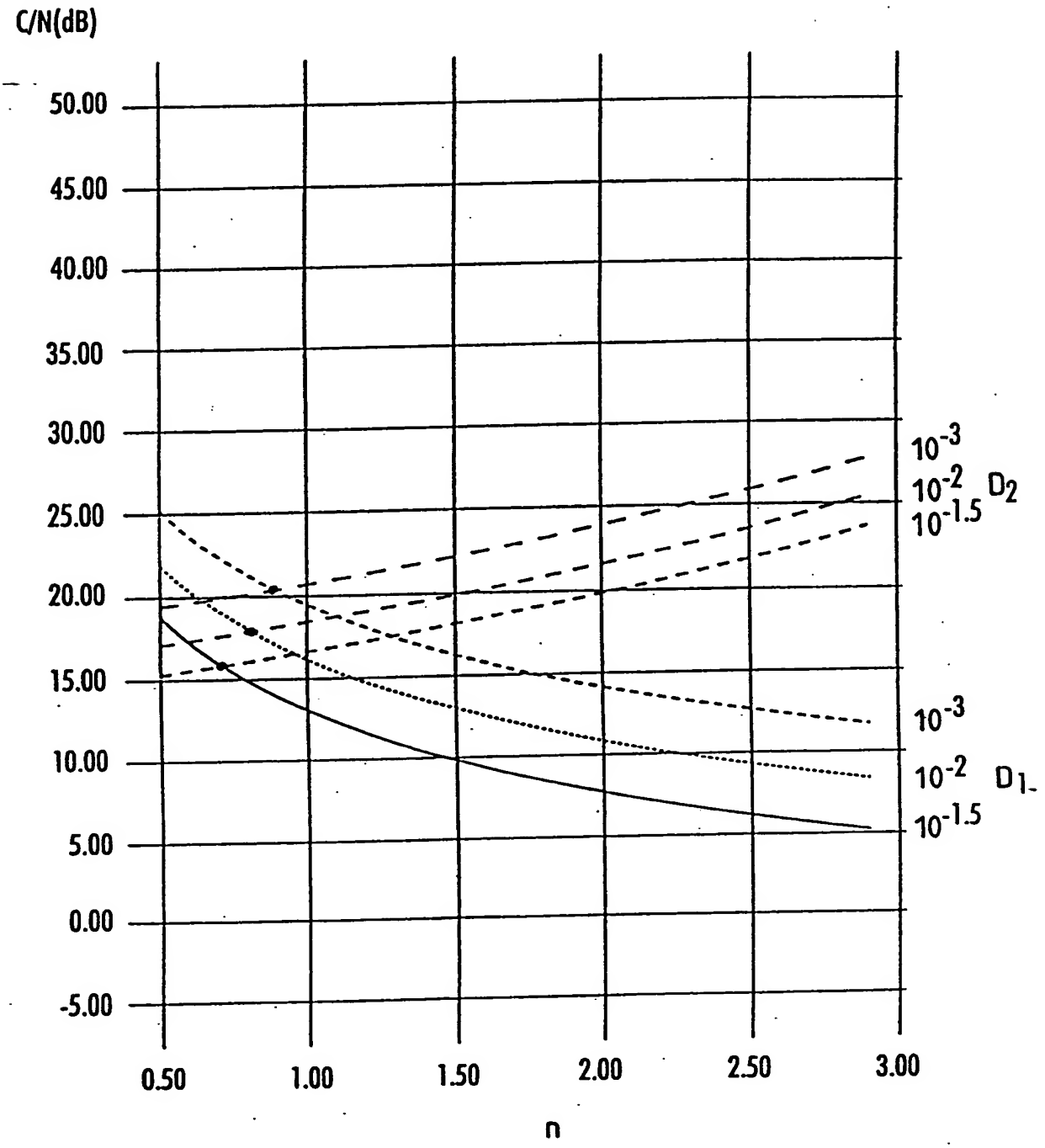

C/N(dB)
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-5.00
0.50
1.00
1.50
2.00
2.50
3.00
n
10^{-3}
10^{-2}
$10^{-1.5}$
D_2
10^{-3}
10^{-2}
$10^{-1.5}$
D_1

FIG. 104

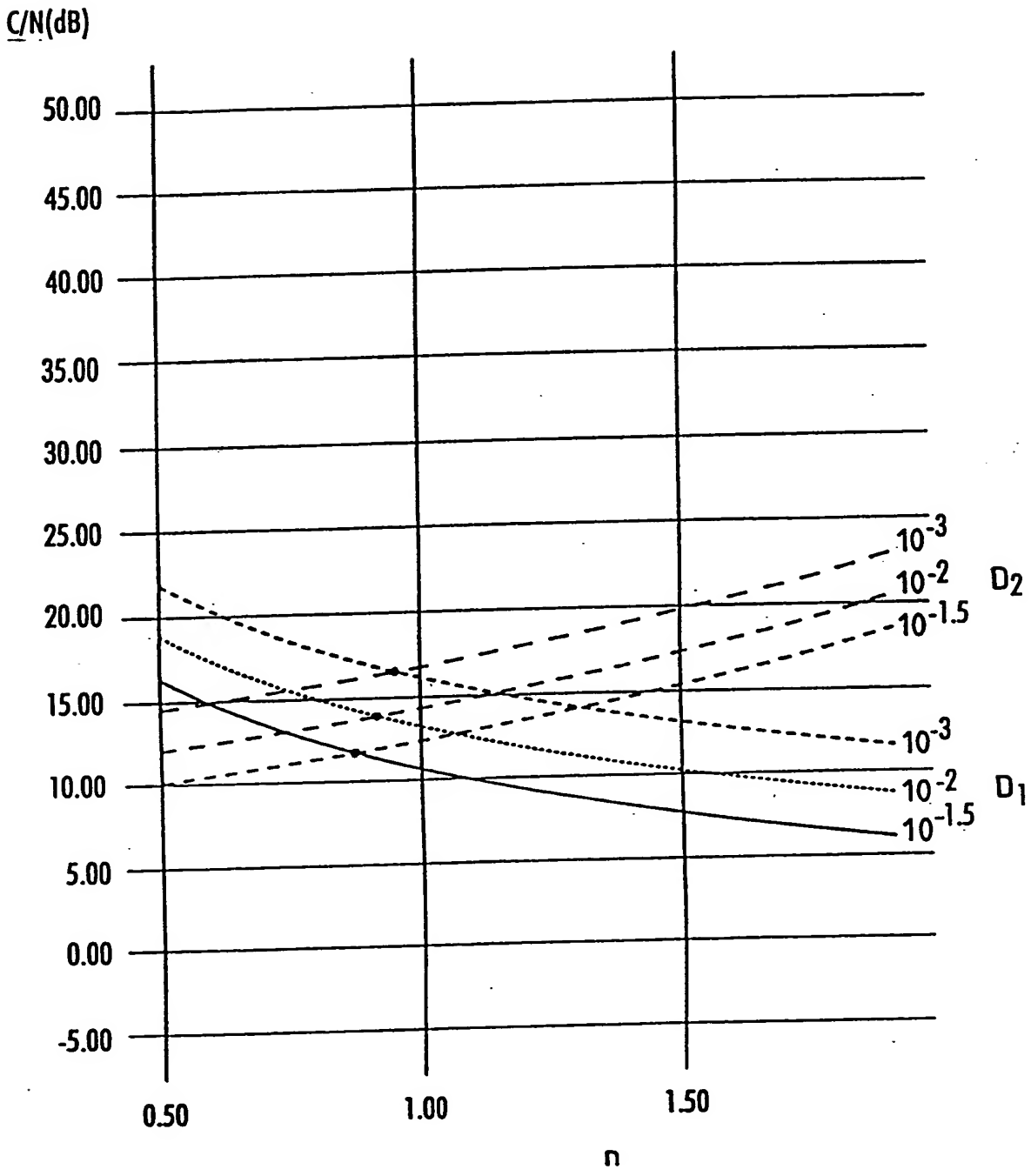

C/N(dB)
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-5.00
0.50
1.00
1.50
n
10^{-3}
10^{-2}
$10^{-1.5}$
D_2
10^{-3}
10^{-2}
$10^{-1.5}$
D_1

FIG. 105

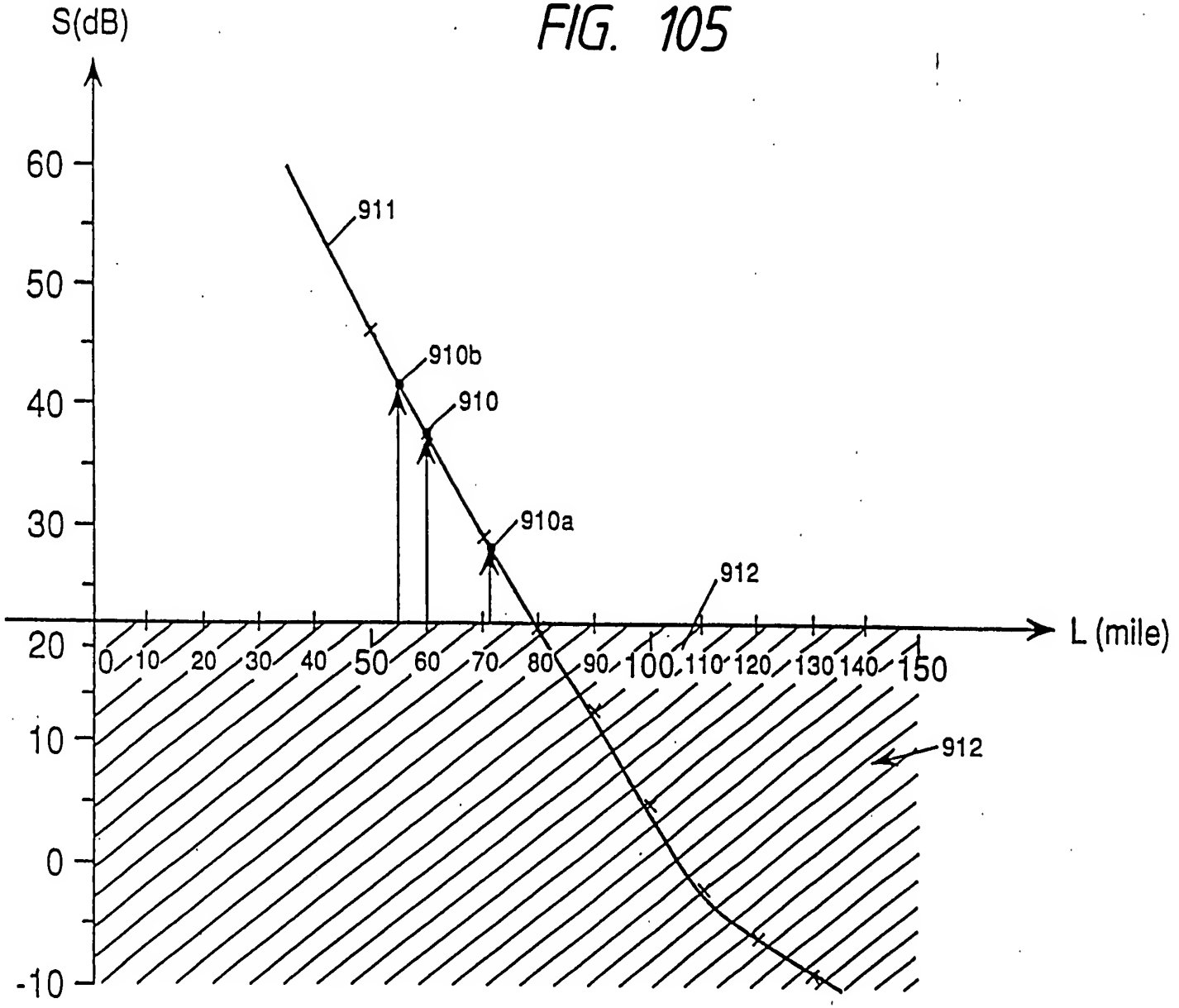

S(dB)
60
50
40
30
20
10
0
-10
911
910b
910
910a
912
912
L (mile)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

FIG. 106

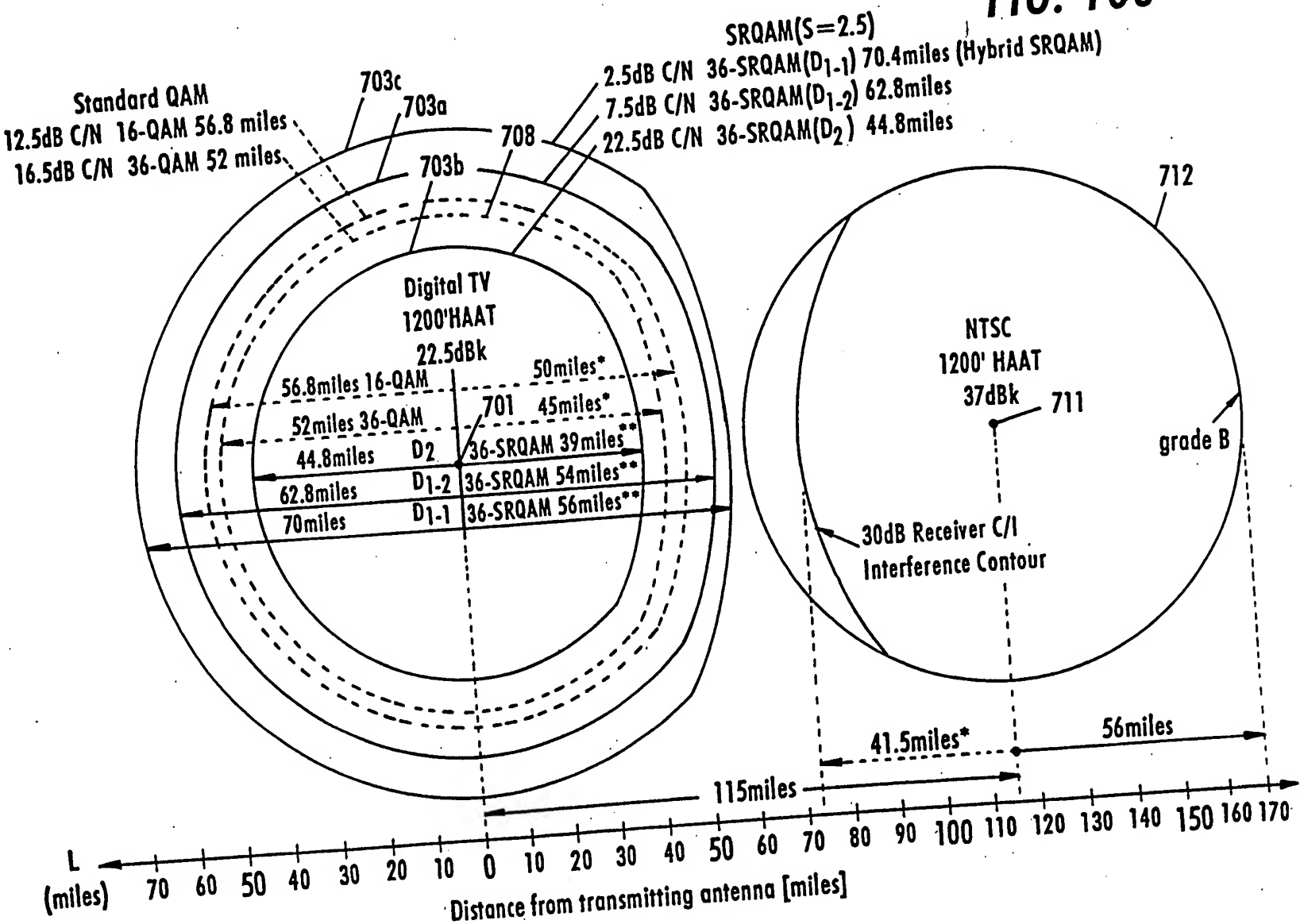

SRQAM(S=2.5)
2.5dB C/N 36-SRQAM(D_{1-1}) 70.4miles (Hybrid SRQAM)
7.5dB C/N 36-SRQAM(D_{1-2}) 62.8miles
22.5dB C/N 36-SRQAM(D_2) 44.8miles
Standard QAM
12.5dB C/N 16-QAM 56.8 miles
16.5dB C/N 36-QAM 52 miles
703c
703a
703b
708
712
Digital TV
1200'HAAT
22.5dBk
NTSC
1200' HAAT
37dBk
711
701
56.8miles 16-QAM
52miles 36-QAM
44.8miles D2
62.8miles D1-2
70miles D1-1
50miles*
45miles*
36-SRQAM 39miles**
36-SRQAM 54miles**
36-SRQAM 56miles**
grade B
30dB Receiver C/I
Interference Contour
41.5miles*
56miles
115miles
L (miles)
70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170
Distance from transmitting antenna [miles]

FIG. 107

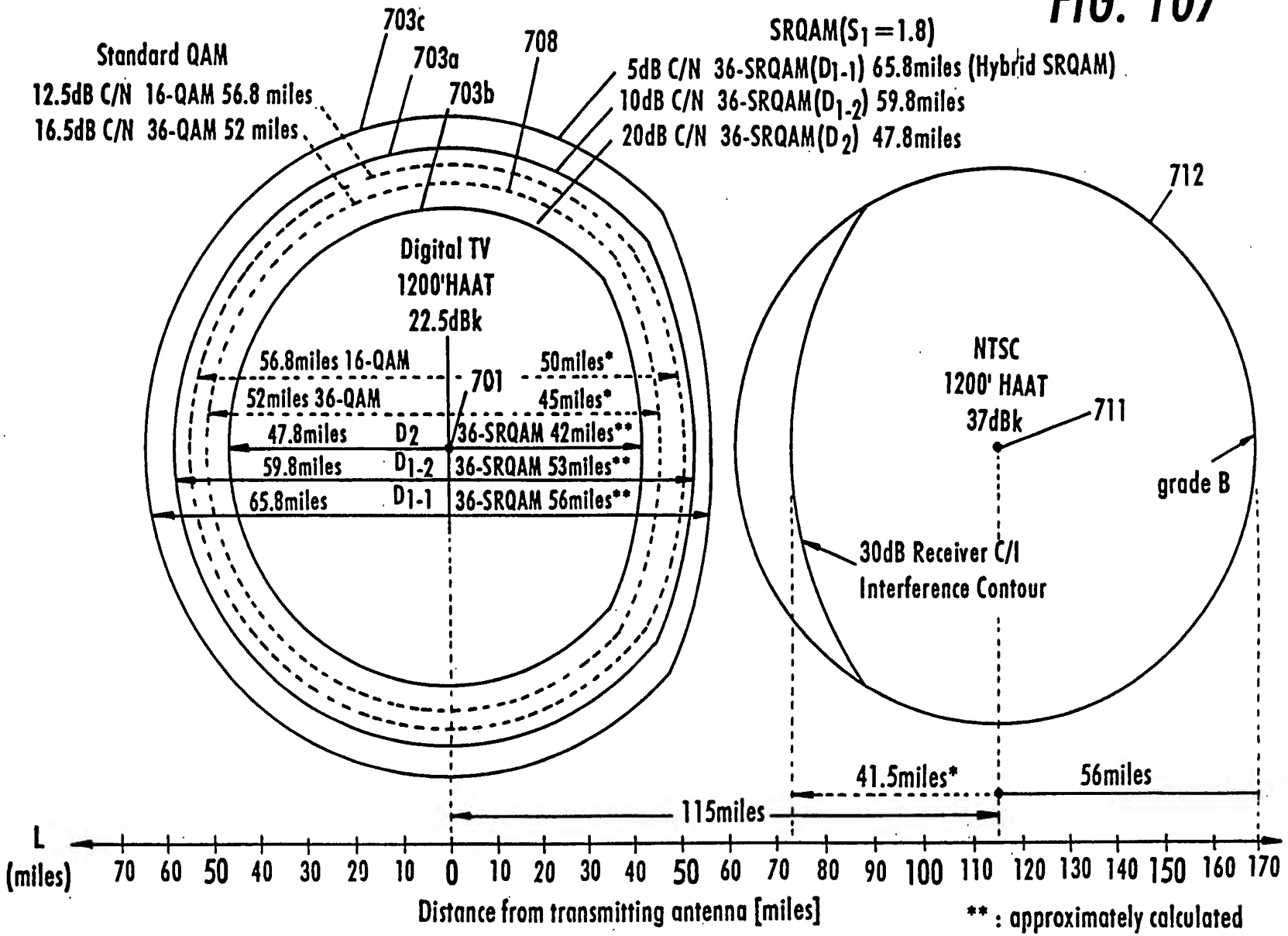

Standard QAM
12.5dB C/N 16-QAM 56.8 miles
16.5dB C/N 36-QAM 52 miles
703c
703a
703b
708
SRQAM(S_1 = 1.8)
5dB C/N 36-SRQAM(D_{1-1}) 65.8miles (Hybrid SRQAM)
10dB C/N 36-SRQAM(D_{1-2}) 59.8miles
20dB C/N 36-SRQAM(D_2) 47.8miles
712
Digital TV
1200'HAAT
22.5dBk
56.8miles 16-QAM
50miles*
701
52miles 36-QAM
45miles*
47.8miles
D_2
36-SRQAM 42miles**
59.8miles
D_{1-2}
36-SRQAM 53miles**
65.8miles
D_{1-1}
36-SRQAM 56miles**
NTSC
1200' HAAT
37dBk
711
grade B
30dB Receiver C/I
Interference Contour
41.5miles*
56miles
115miles
L
(miles)
70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170
Distance from transmitting antenna [miles]
** : approximately calculated

FIG. 108(A)

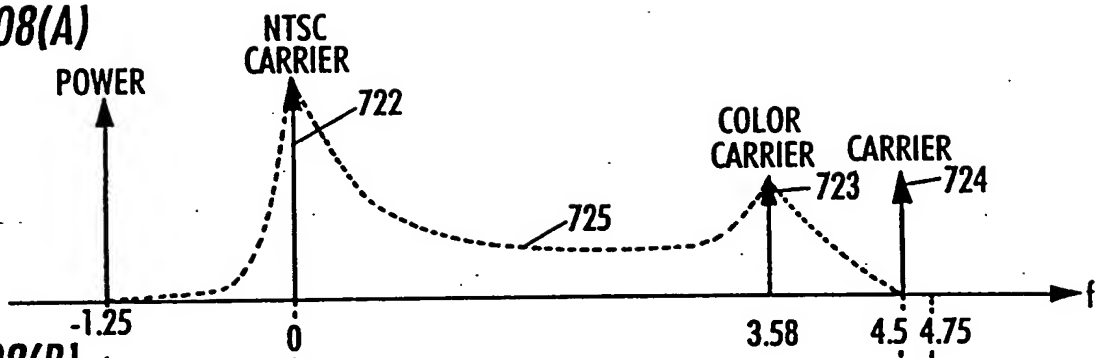


FIG. 108(B)

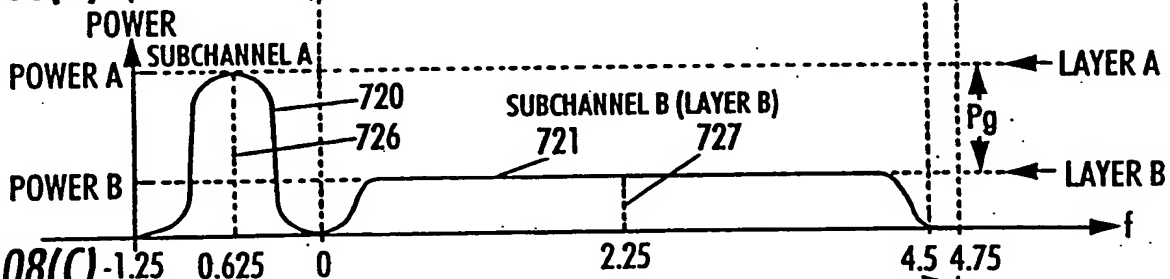


FIG. 108(C)

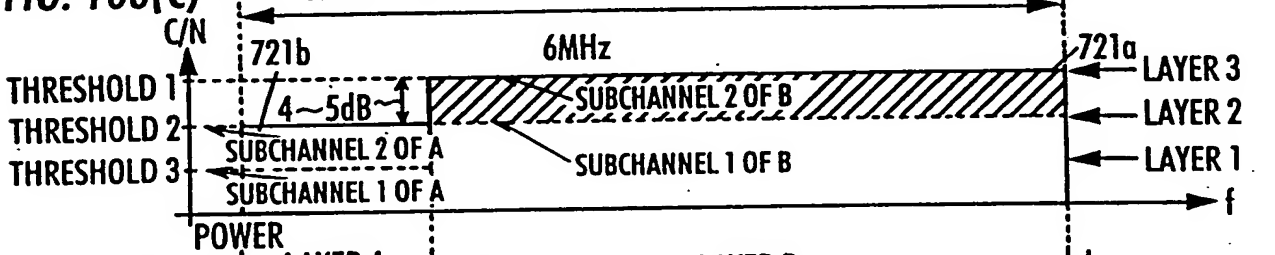


FIG. 108(D)

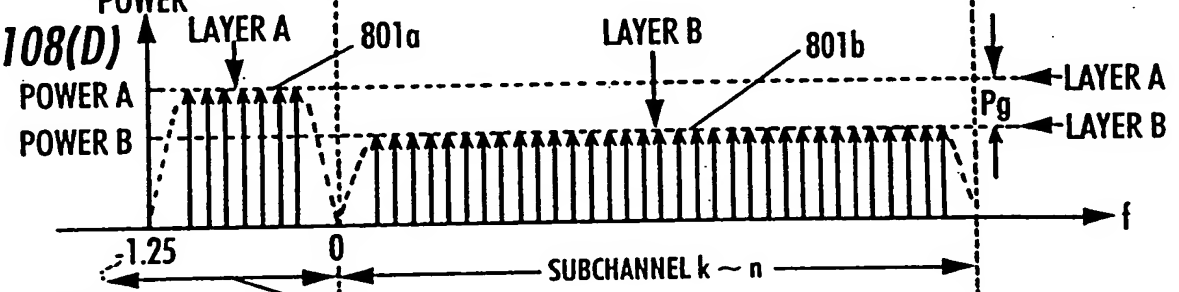


FIG. 108(E)

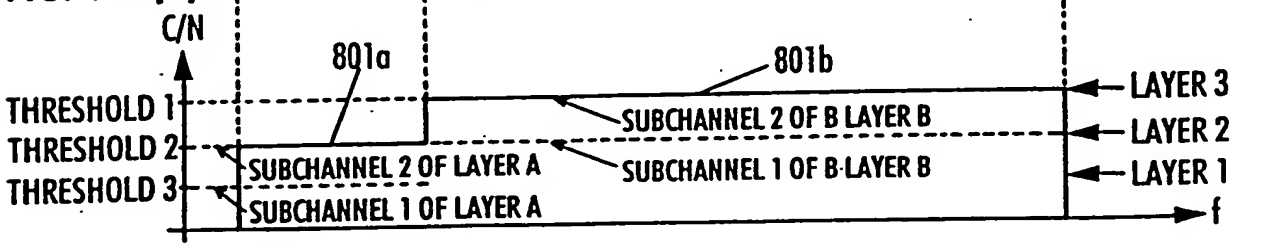


FIG. 109

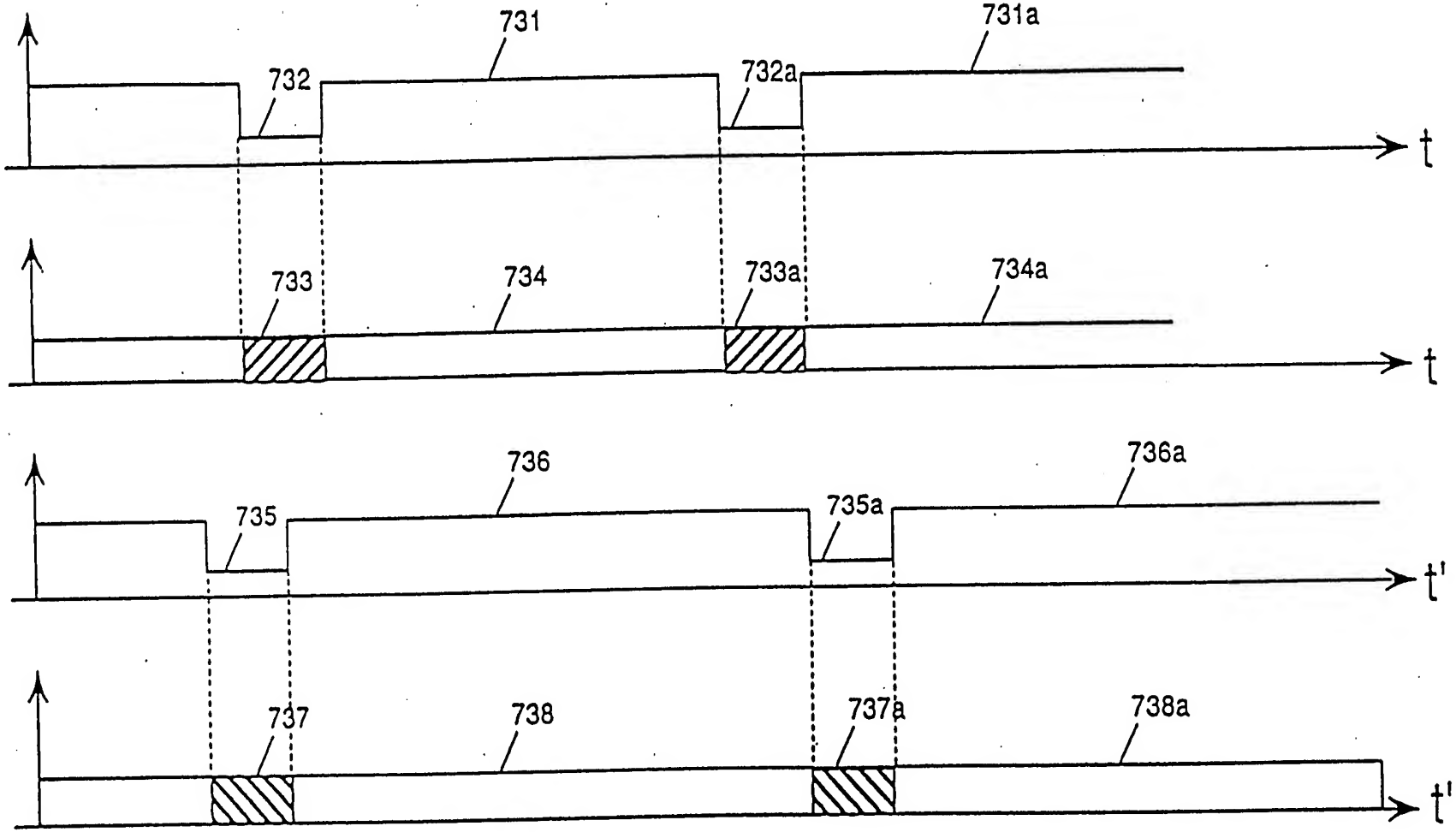

731
731a
732
732a
t
733
734
733a
734a
t
736
736a
735
735a
t'
737
738
737a
738a
t'

FIG. 110

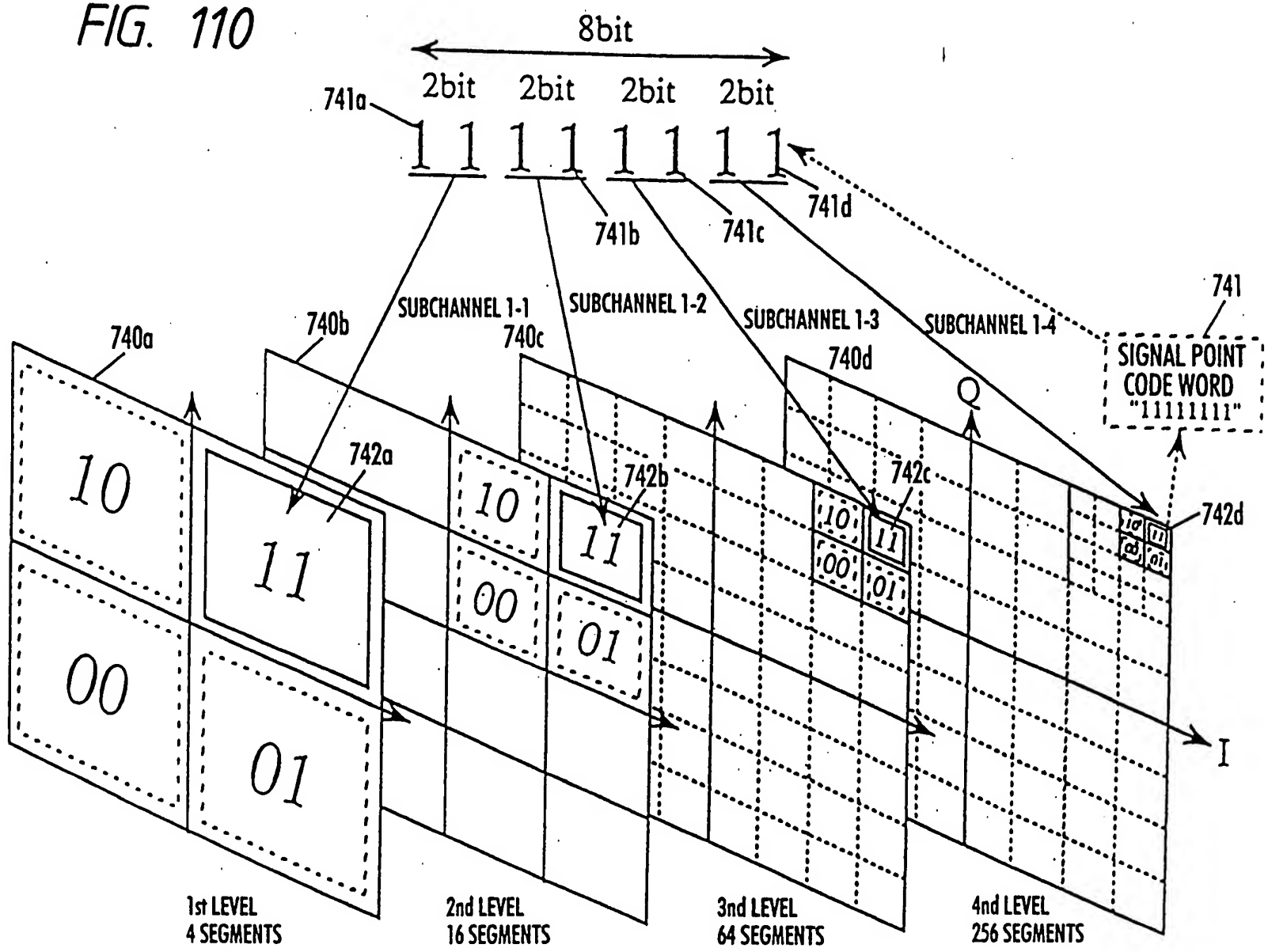

8bit
2bit 2bit 2bit 2bit
741a
1 1 1 1 1 1 1 1
741b
741c
741d
741
SIGNAL POINT
CODE WORD
"11111111"
SUBCHANNEL 1-1
SUBCHANNEL 1-2
SUBCHANNEL 1-3
SUBCHANNEL 1-4
740a
740b
740c
740d
742a
742b
742c
742d
10
11
00
01
I
Q
1st LEVEL
4 SEGMENTS
2nd LEVEL
16 SEGMENTS
3nd LEVEL
64 SEGMENTS
4nd LEVEL
256 SEGMENTS

FIG. 111

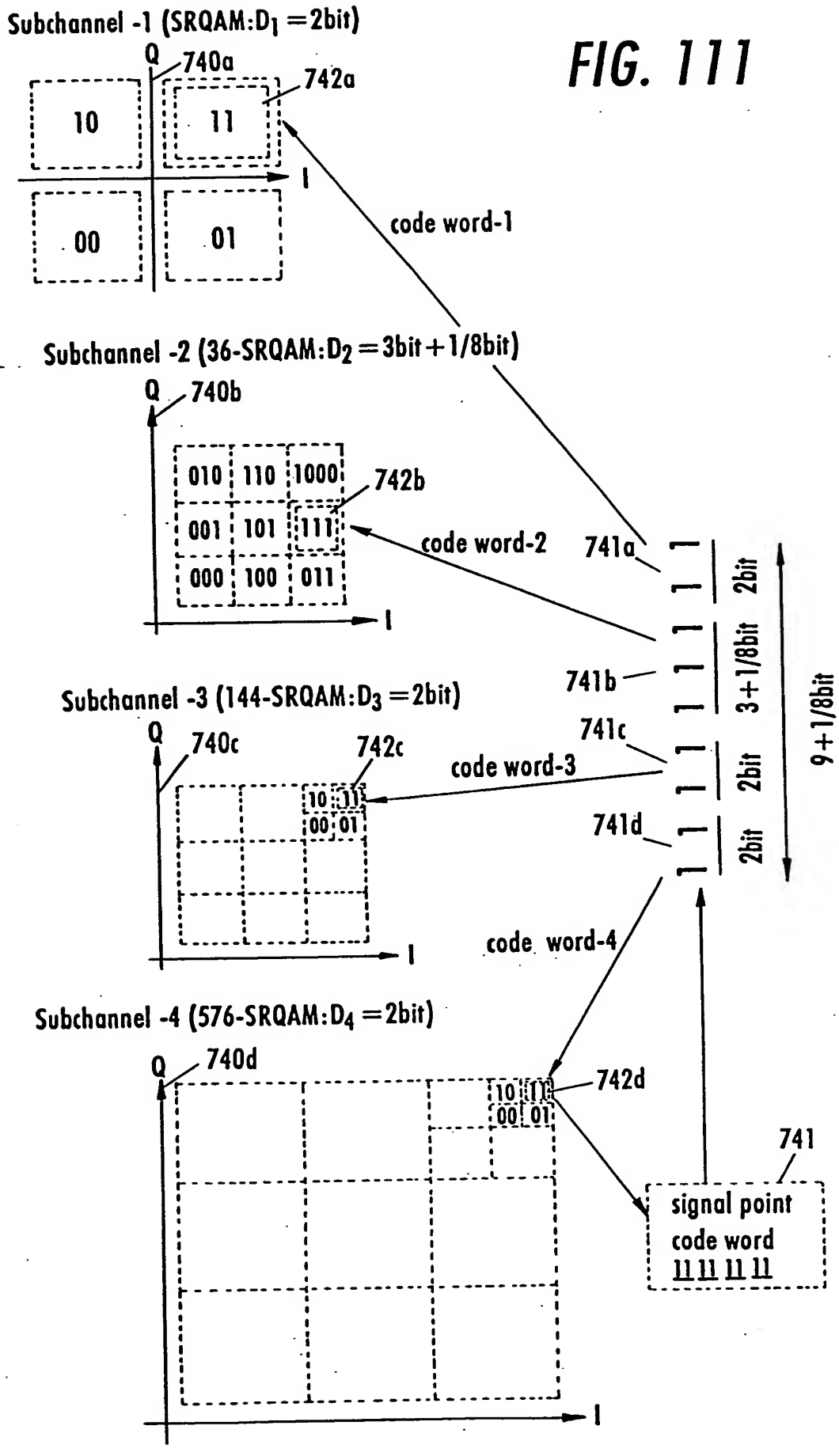

Subchannel -1 (SRQAM:D1 =2bit)
Q
740a
742a
10
11
00
01
I
code word-1
Subchannel -2 (36-SRQAM:D2 =3bit+1/8bit)
Q
740b
010
110
1000
742b
001
101
111
000
100
011
I
code word-2
741a
741b
Subchannel -3 (144-SRQAM:D3 =2bit)
Q
740c
742c
10
11
00
01
I
741c
code word-3
741d
2bit
3+1/8bit
2bit
2bit
9+1/8bit
code word-4
Subchannel -4 (576-SRQAM:D4 =2bit)
Q
740d
742d
10
11
00
01
I
741
signal point
code word
11 11 11 11

FIG. 112

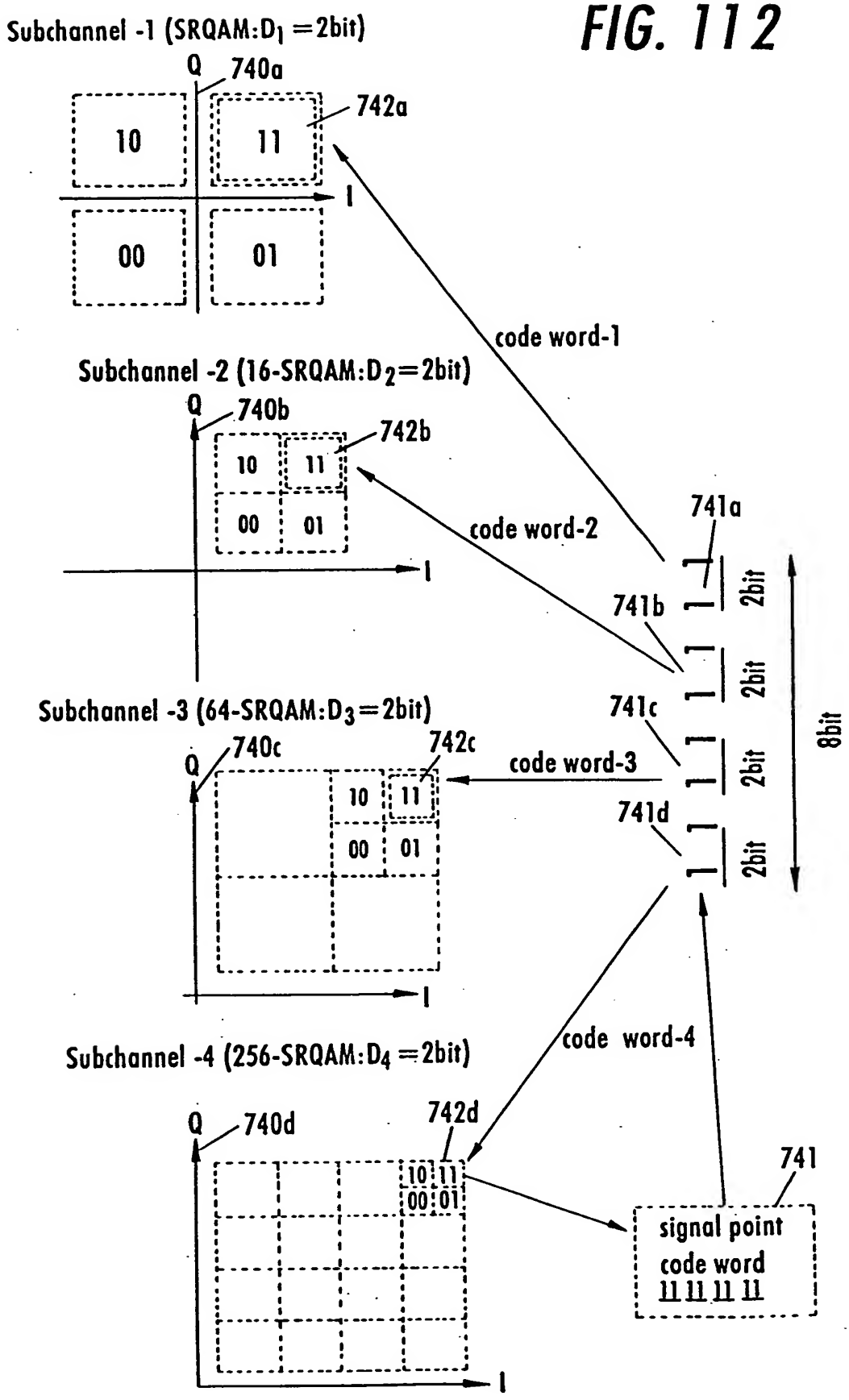

Subchannel -1 (SRQAM:D1 =2bit)
Q
740a
742a
10
11
I
00
01
code word-1
Subchannel -2 (16-SRQAM:D2=2bit)
740b
742b
code word-2
741a
741b
2bit
8bit
Subchannel -3 (64-SRQAM:D3=2bit)
741c
740c
742c
code word-3
741d
Subchannel -4 (256-SRQAM:D4 =2bit)
code word-4
740d
742d
741
signal point
code word
11 11 11 11

FIG. 113

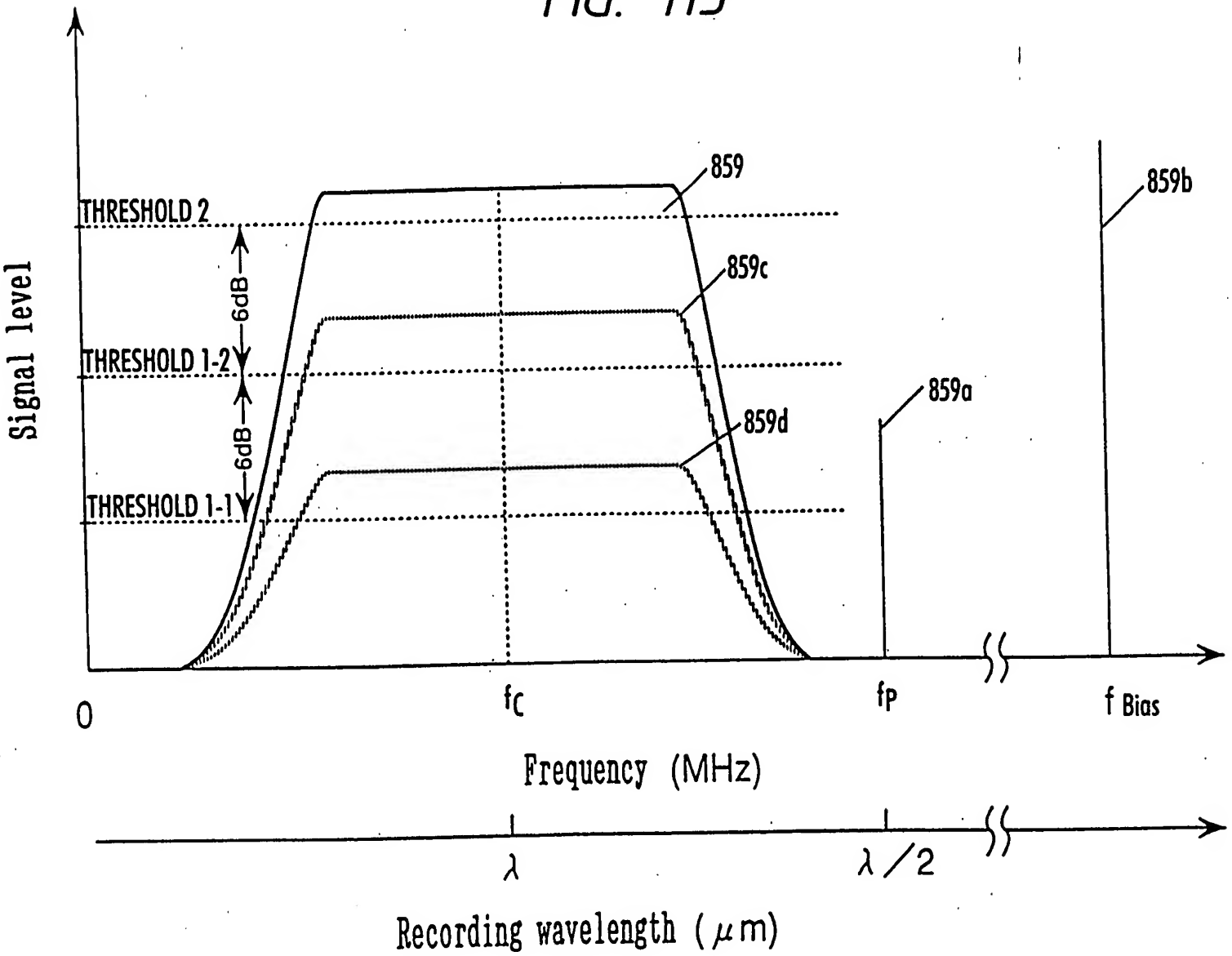

Signal level
THRESHOLD 2
THRESHOLD 1-2
THRESHOLD 1-1
6dB
6dB
859
859b
859c
859a
859d
0
fC
fP
f Bias
Frequency (MHz)
λ
λ/2
Recording wavelength (μm)

FIG. 114

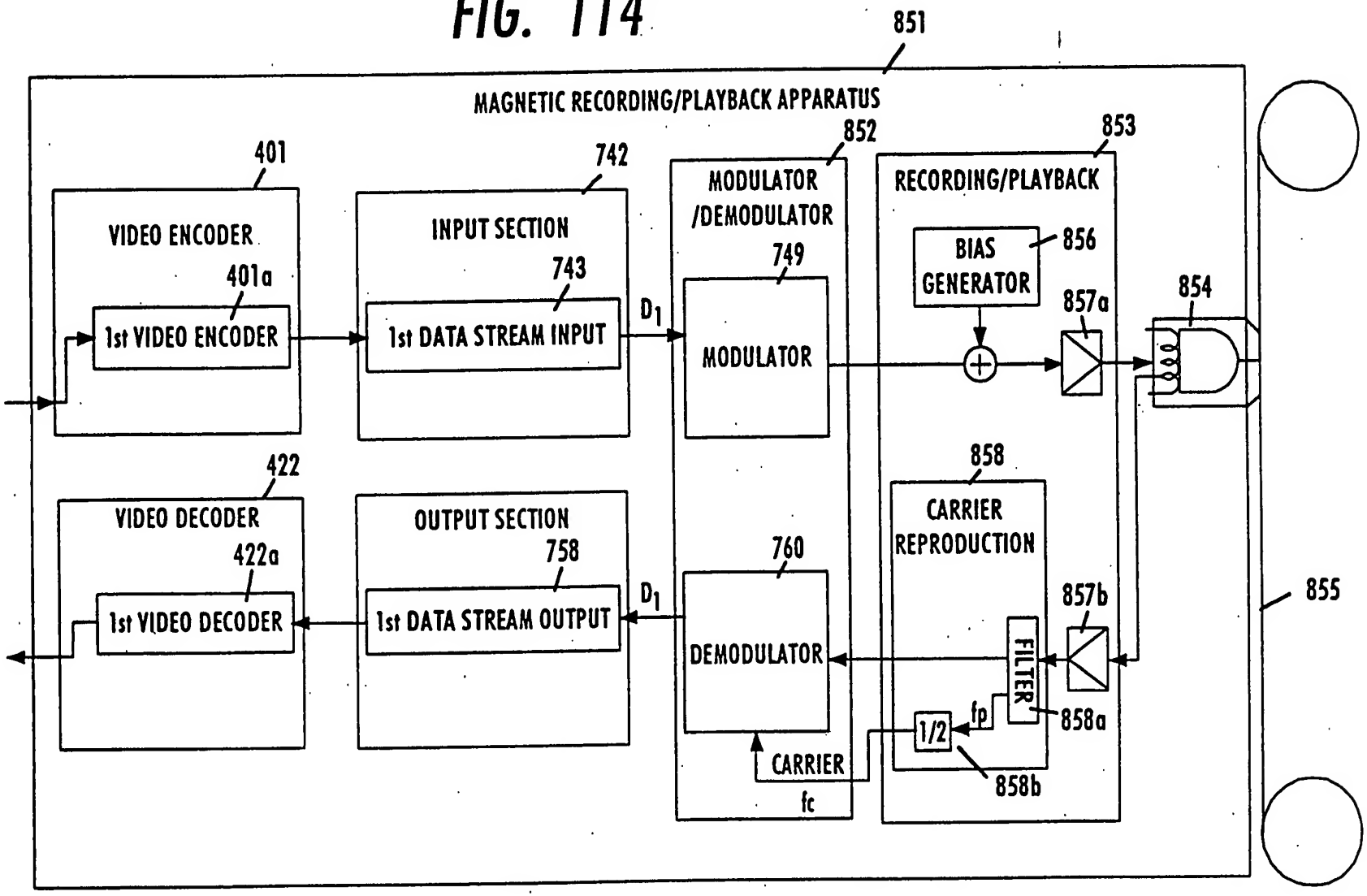

851
MAGNETIC RECORDING/PLAYBACK APPARATUS
401
VIDEO ENCODER
401a
1st VIDEO ENCODER
742
INPUT SECTION
743
1st DATA STREAM INPUT
852
MODULATOR /DEMODULATOR
749
MODULATOR
853
RECORDING/PLAYBACK
BIAS GENERATOR
856
857a
854
422
VIDEO DECODER
422a
1st VIDEO DECODER
OUTPUT SECTION
758
1st DATA STREAM OUTPUT
760
DEMODULATOR
858
CARRIER REPRODUCTION
857b
855
FILTER
858a
1/2
fp
CARRIER
fc
858b
D1
D1

FIG. 115

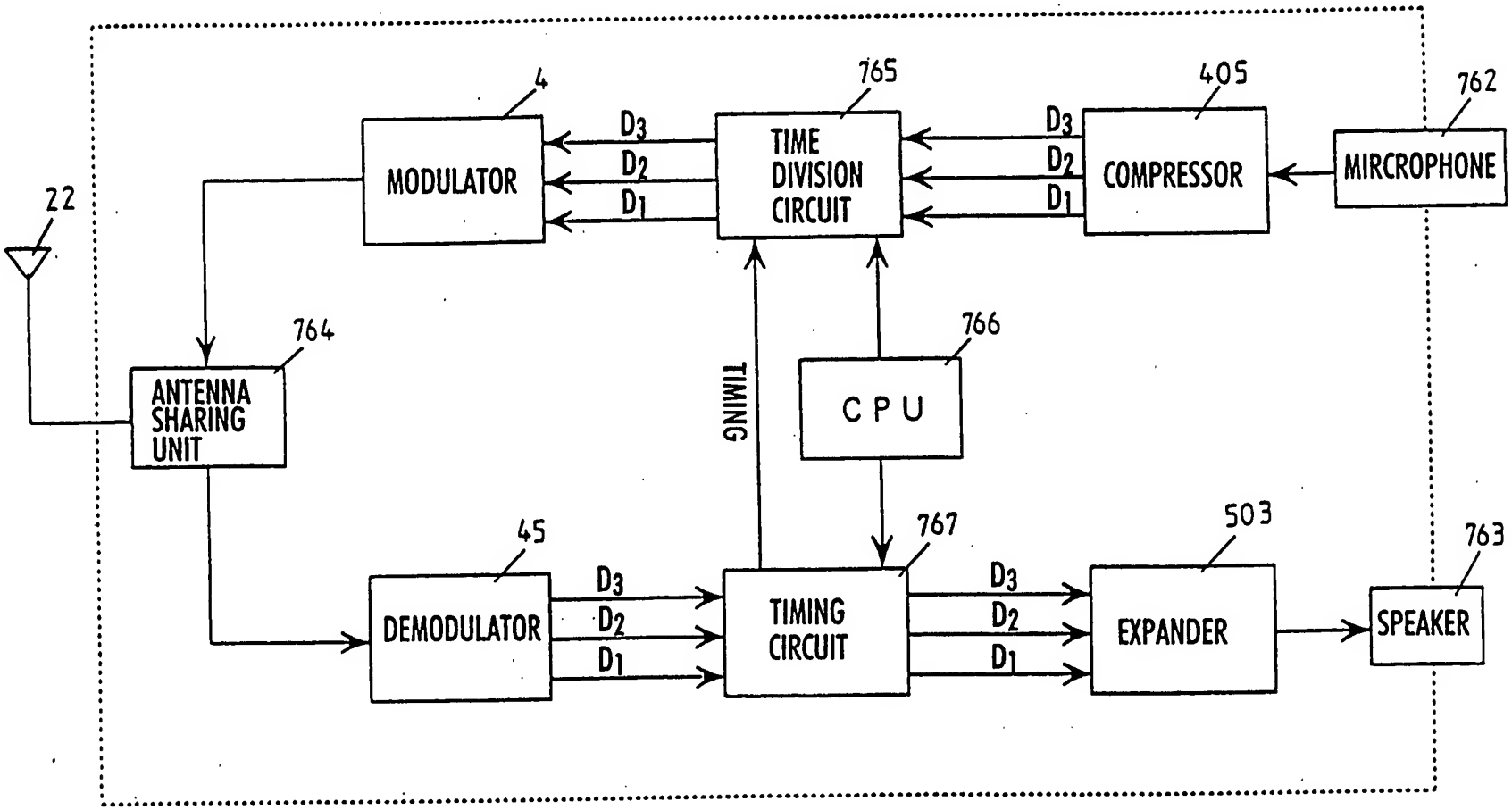

22
4
MODULATOR
765
TIME DIVISION CIRCUIT
405
COMPRESSOR
762
MIRCROPHONE
D3
D2
D1
764
ANTENNA SHARING UNIT
TIMING
766
CPU
45
DEMODULATOR
767
TIMING CIRCUIT
503
EXPANDER
763
SPEAKER

FIG. 116

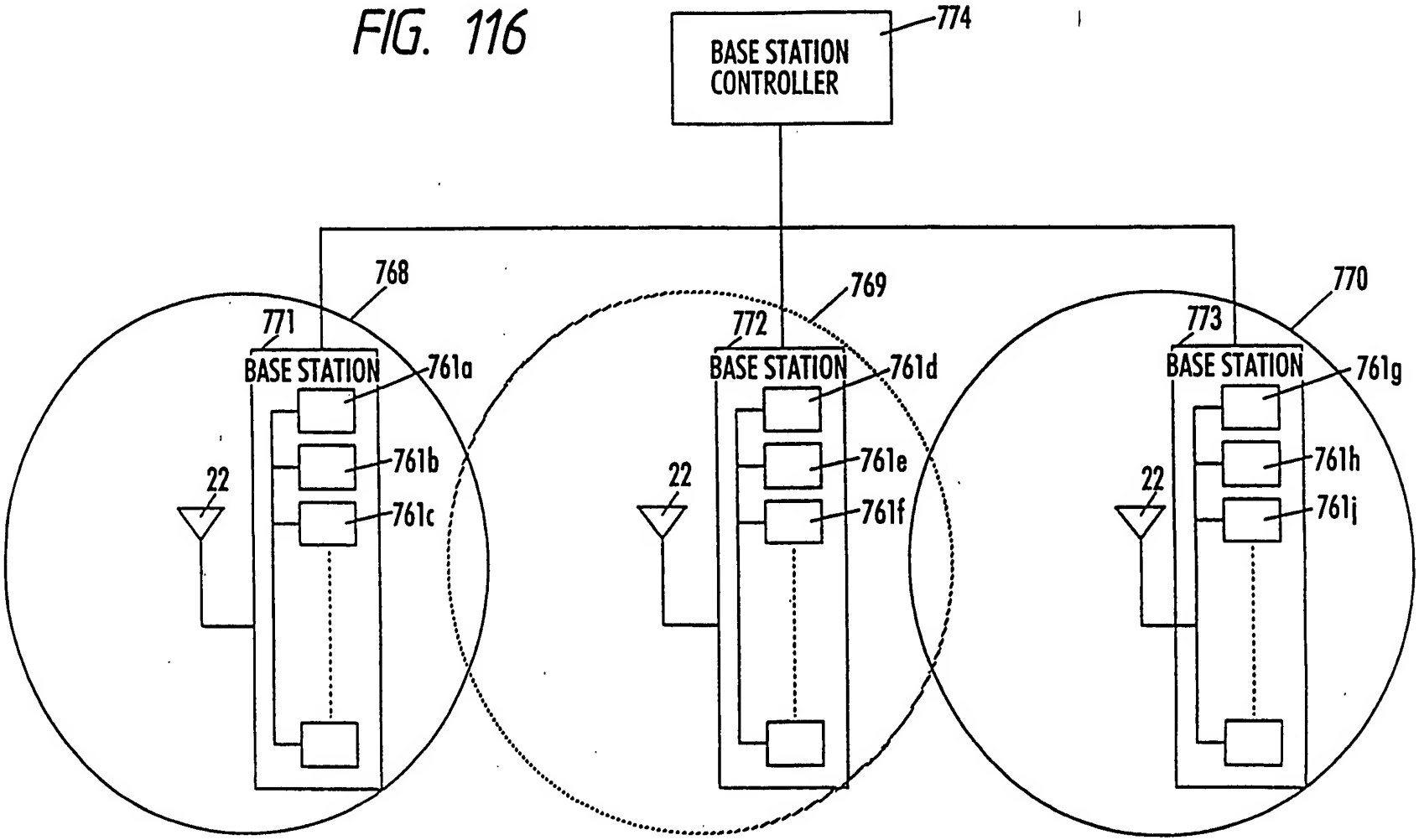

BASE STATION CONTROLLER
774
768
769
770
771
772
773
BASE STATION
BASE STATION
BASE STATION
761a
761b
761c
761d
761e
761f
761g
761h
761j
22
22
22

FIG. 117

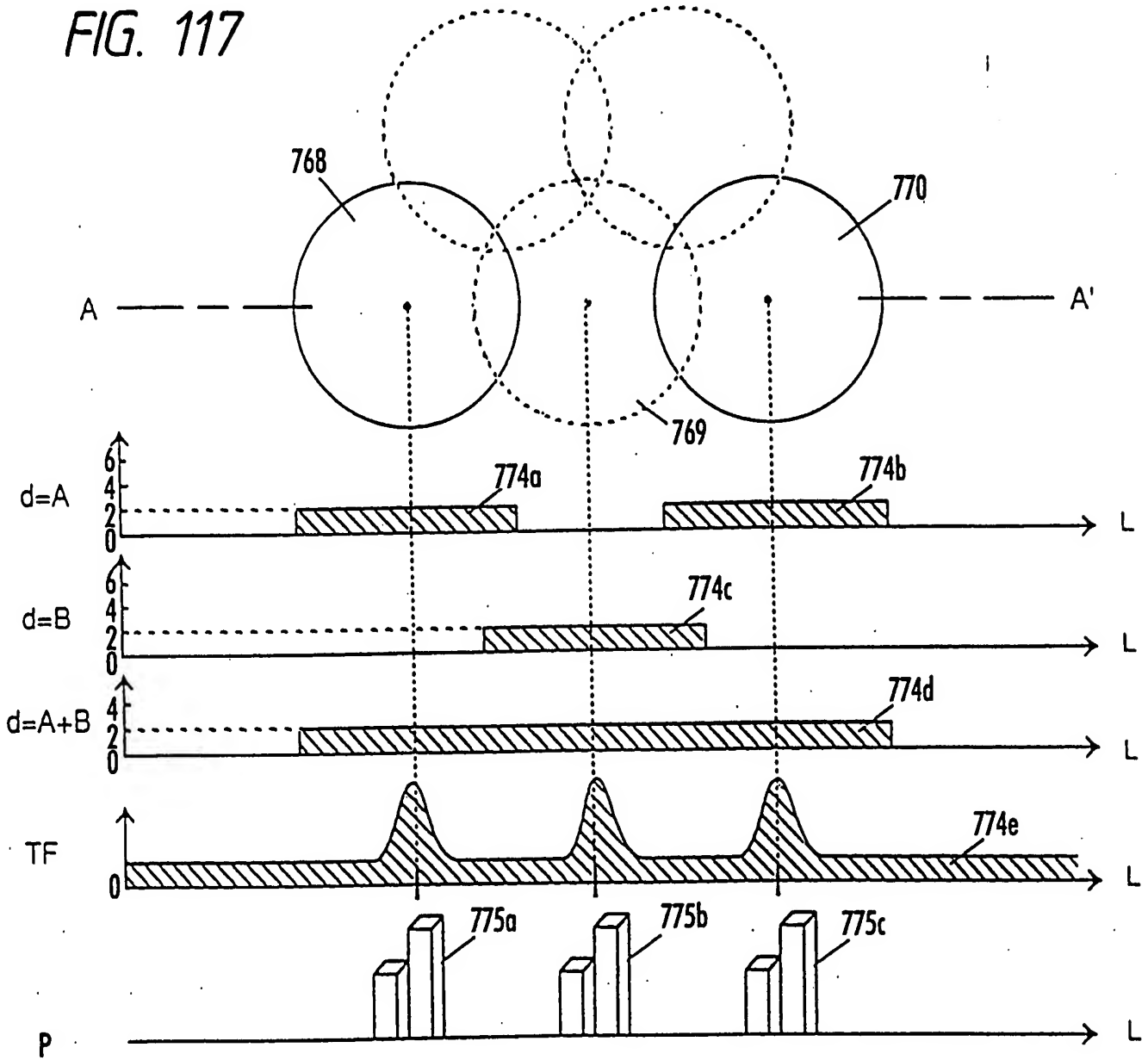

768
770
A
A'
769
d=A
6
4
2
0
774a
774b
L
d=B
774c
d=A+B
774d
TF
774e
775a
775b
775c
P

FIG. 118

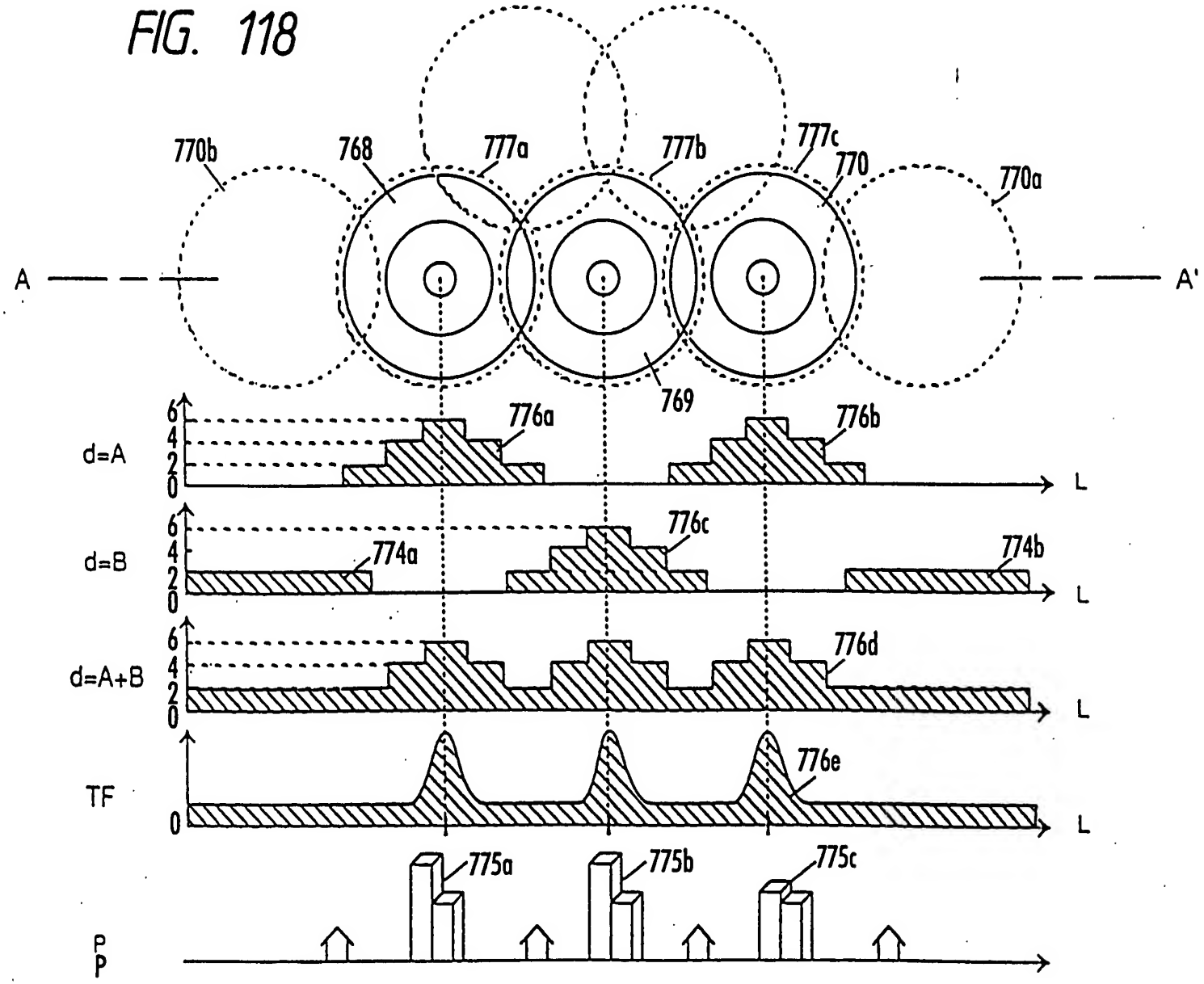

770b
768
777a
777b
777c
770
770a
A
A'
769
776a
776b
d=A
6
4
2
0
L
776c
774a
774b
d=B
776d
d=A+B
TF
776e
775a
775b
775c
P
P

FIG. 119(a)

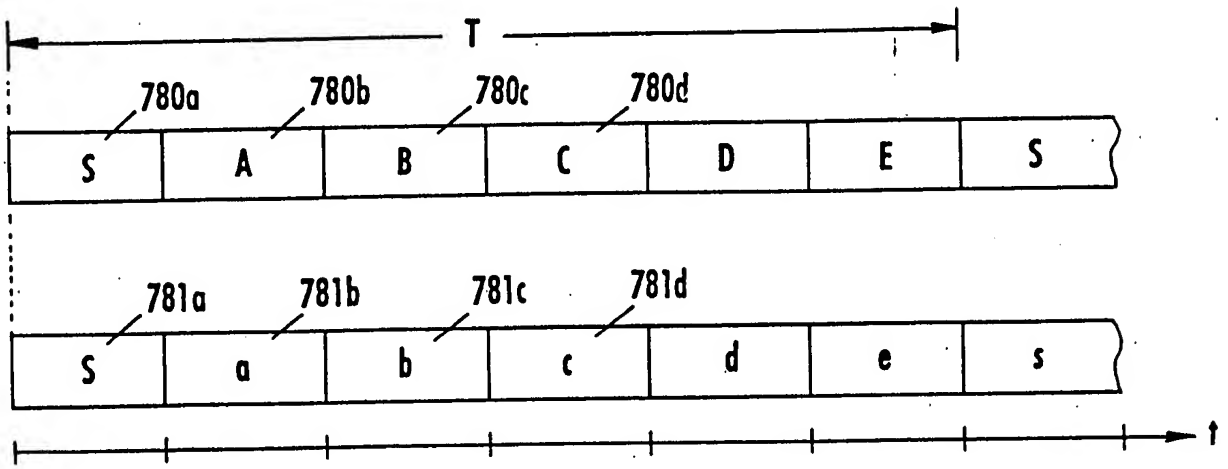


FIG. 119(b)

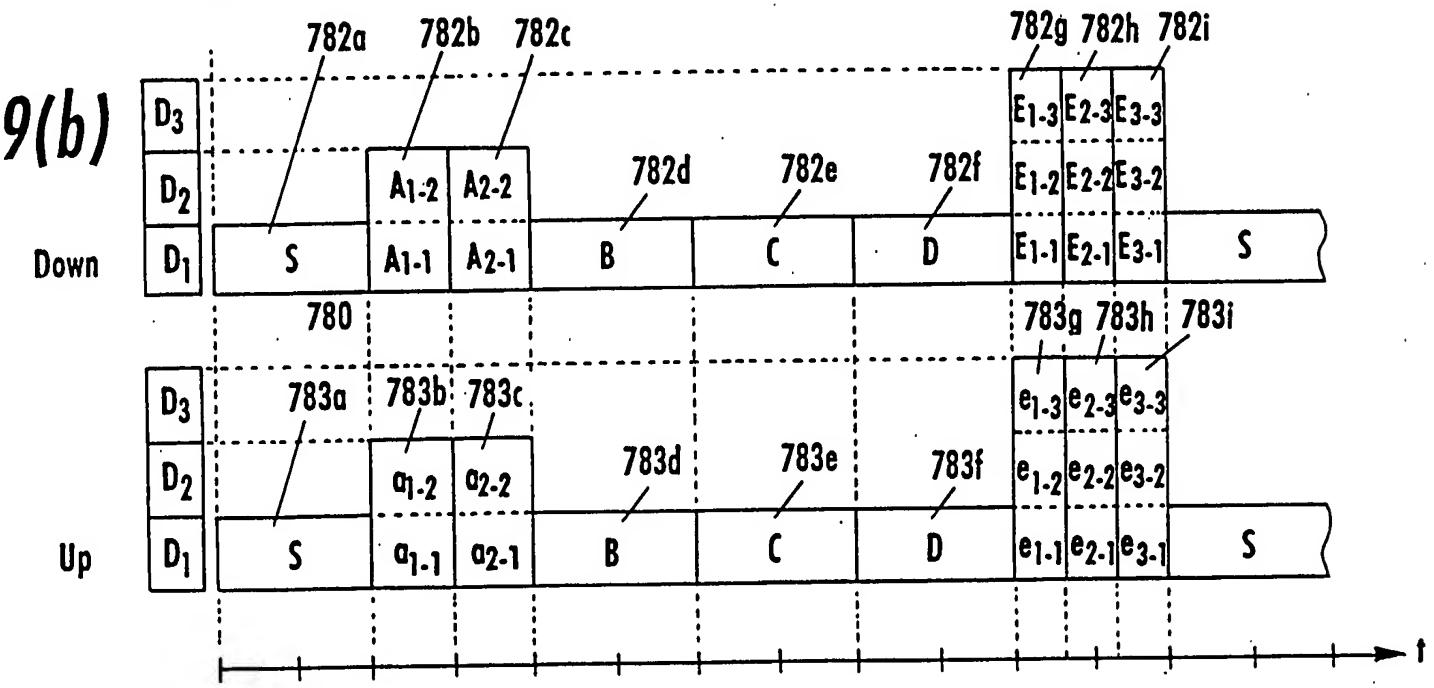


FIG. 120(a)

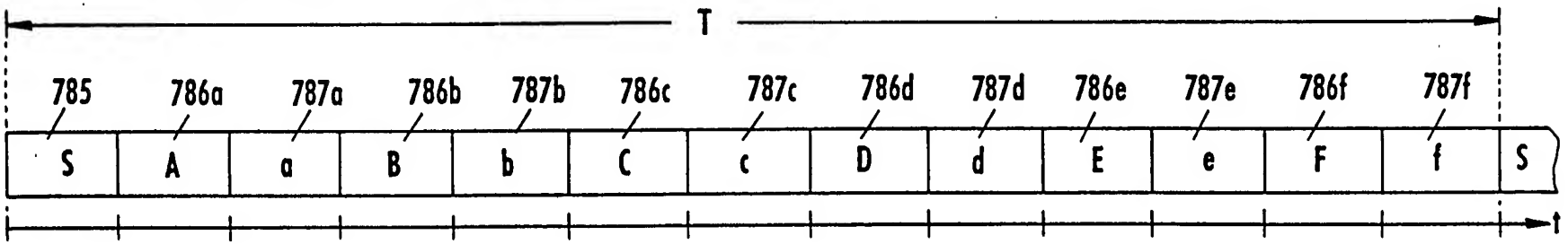


FIG. 120(b)

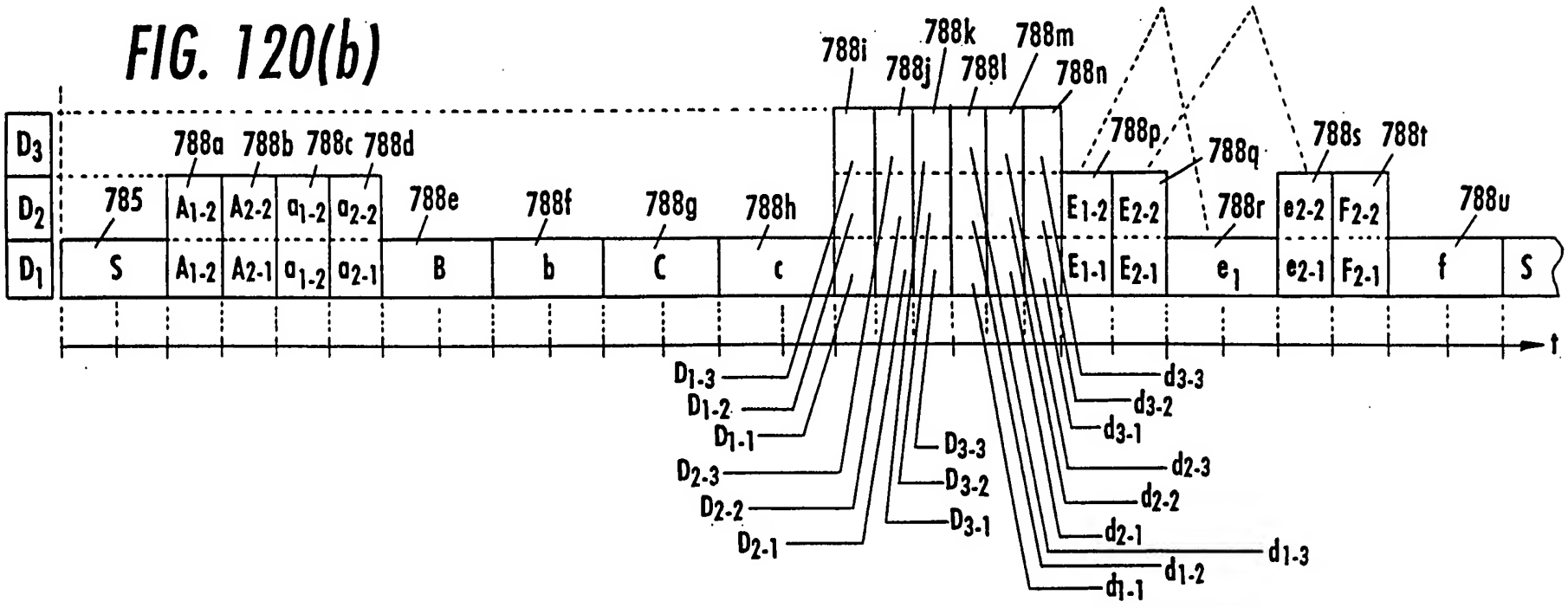


FIG. 121

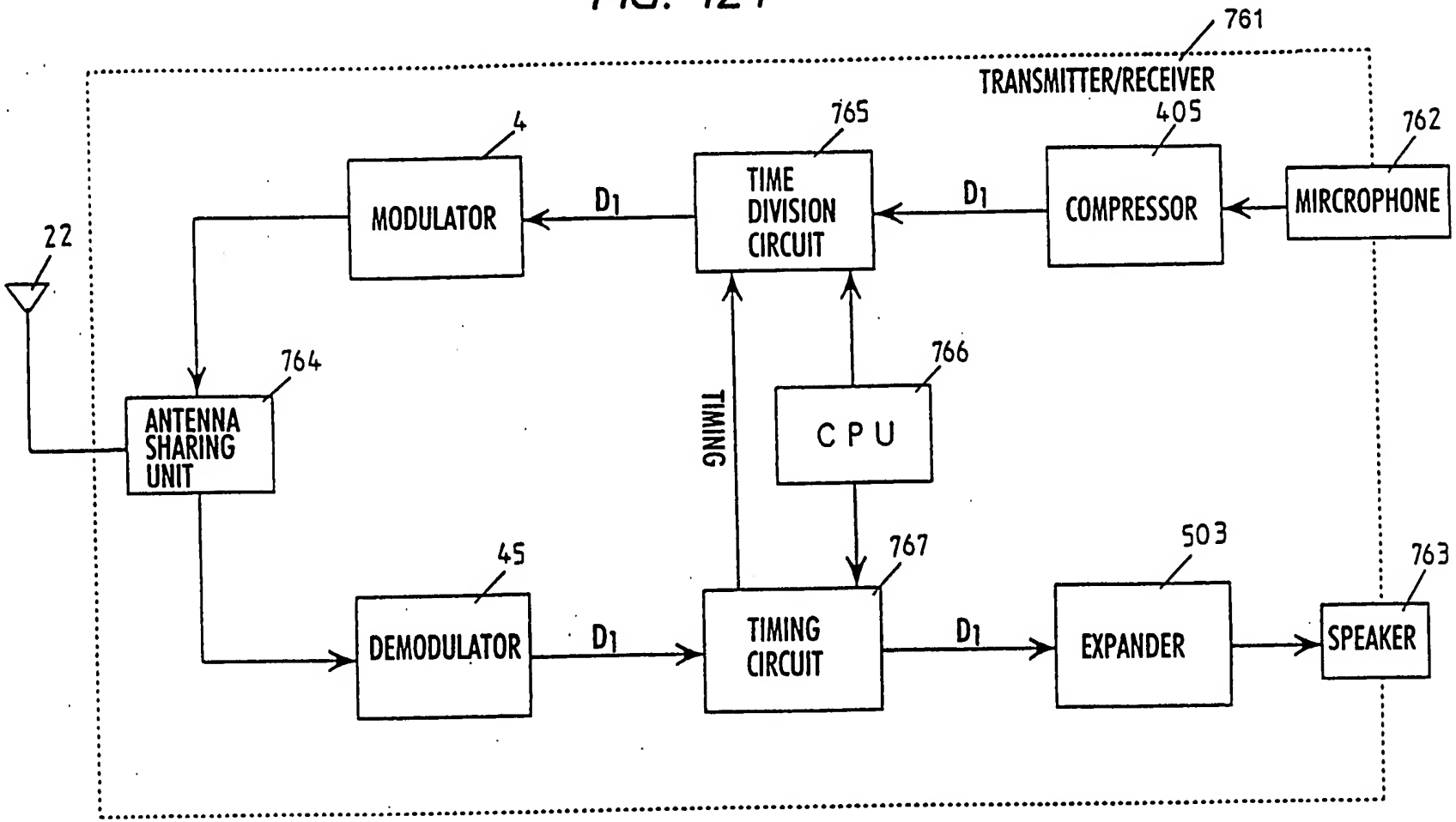

761
TRANSMITTER/RECEIVER
4
765
405
762
MODULATOR
D1
TIME DIVISION CIRCUIT
D1
COMPRESSOR
MIRCROPHONE
22
764
766
ANTENNA SHARING UNIT
TIMING
CPU
45
767
503
763
DEMODULATOR
D1
TIMING CIRCUIT
D1
EXPANDER
SPEAKER

FIG. 122

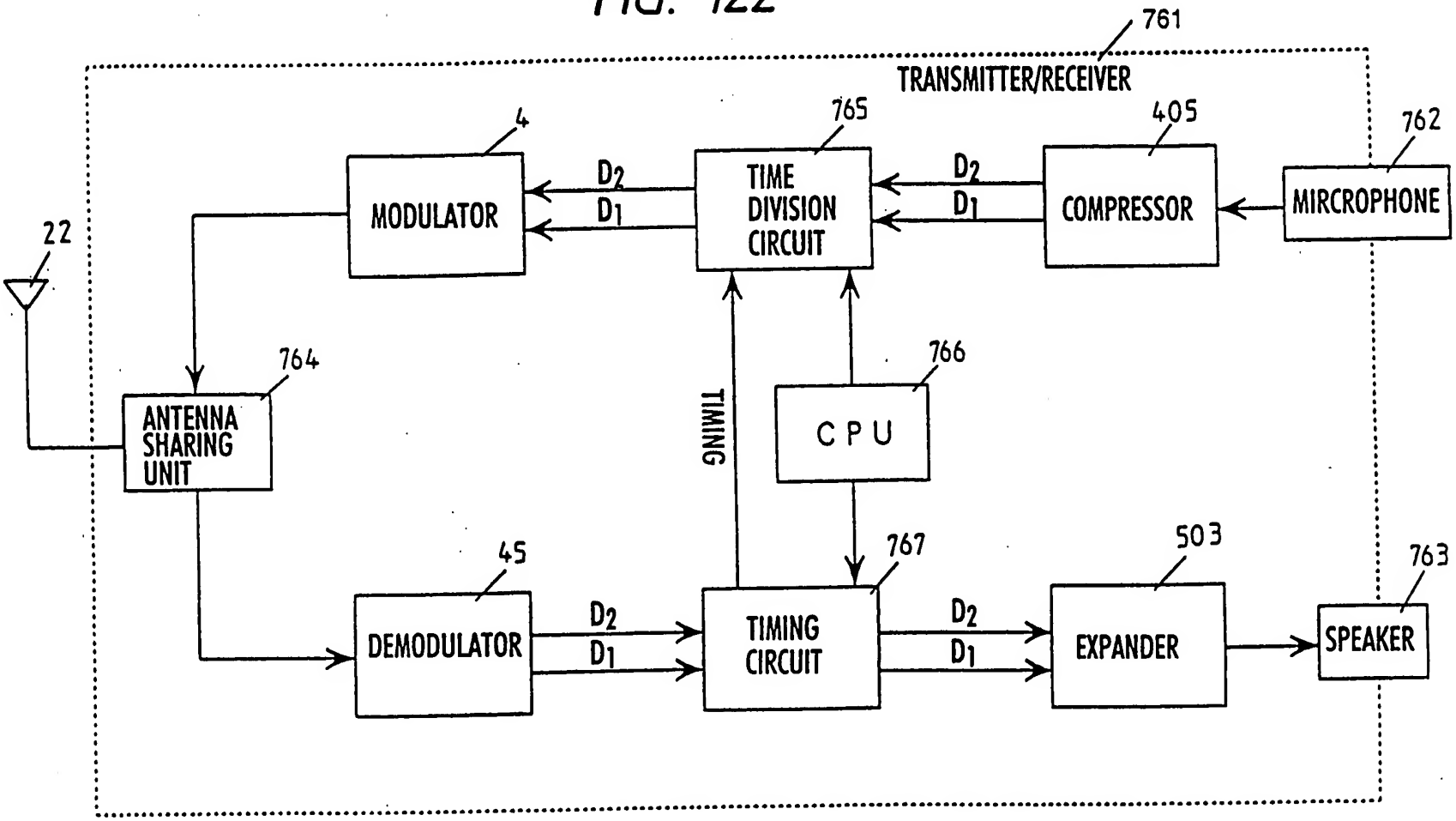

761
TRANSMITTER/RECEIVER
4
765
405
762
MODULATOR
D2
D1
TIME DIVISION CIRCUIT
D2
D1
COMPRESSOR
MIRCROPHONE
22
764
766
ANTENNA SHARING UNIT
TIMING
CPU
45
767
503
763
DEMODULATOR
D2
D1
TIMING CIRCUIT
D2
D1
EXPANDER
SPEAKER

FIG. 123

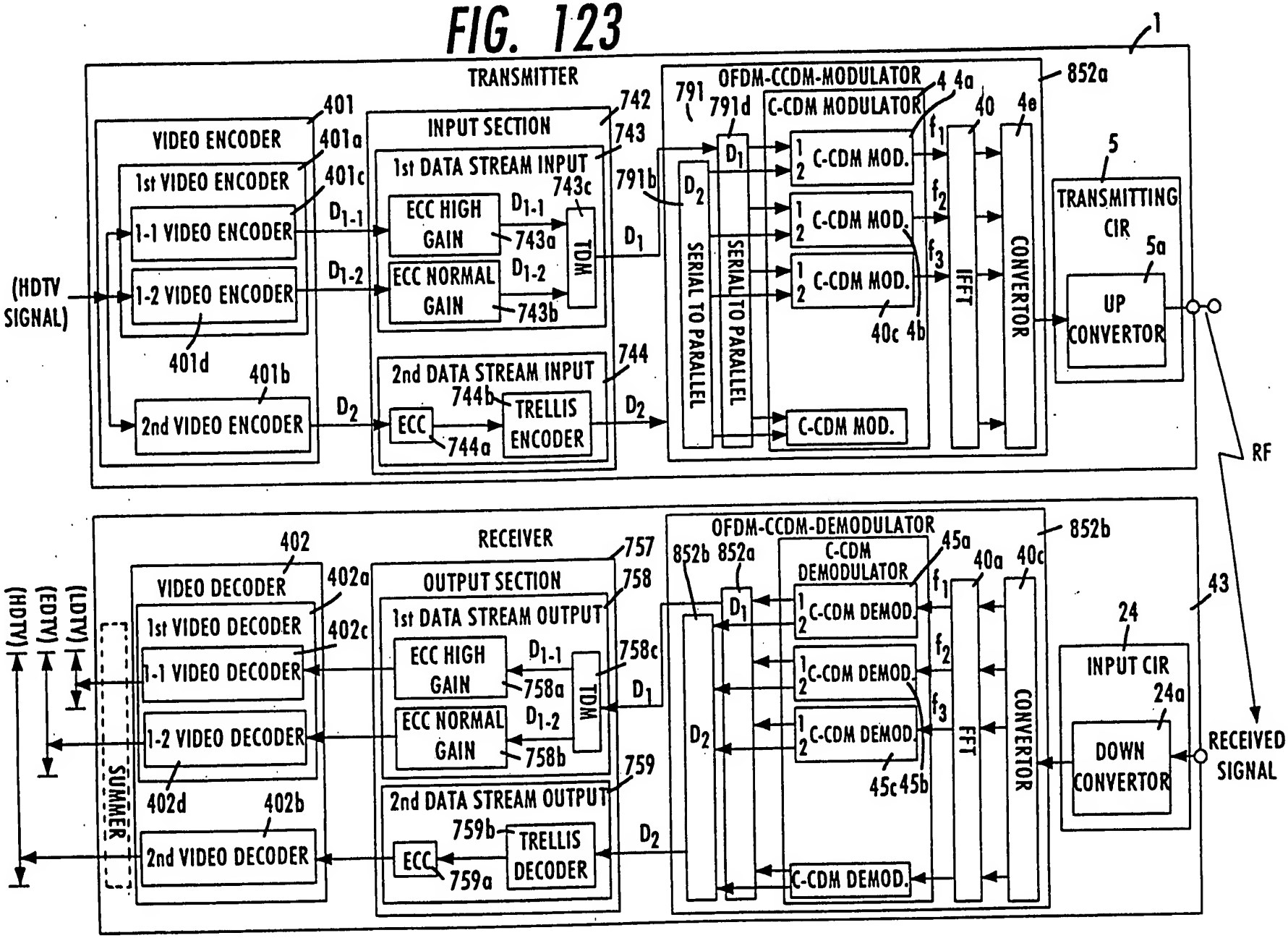

1
TRANSMITTER
401
VIDEO ENCODER
401a
1st VIDEO ENCODER
401c
1-1 VIDEO ENCODER
1-2 VIDEO ENCODER
401d
401b
2nd VIDEO ENCODER
(HDTV SIGNAL)
D1-1
D1-2
D2
742
INPUT SECTION
743
1st DATA STREAM INPUT
743c
ECC HIGH GAIN
743a
ECC NORMAL GAIN
743b
TDM
D1
744
2nd DATA STREAM INPUT
744b
ECC
744a
TRELLIS ENCODER
OFDM-CCDM-MODULATOR
852a
791
791d
791b
D1
D2
SERIAL TO PARALLEL
C-CDM MODULATOR
4
4a
1/2 C-CDM MOD.
C-CDM MOD.
C-CDM MOD.
C-CDM MOD.
40c
4b
f1
f2
f3
40
IFFT
4e
CONVERTOR
5
TRANSMITTING CIR
5a
UP CONVERTOR
RF
RECEIVER
402
VIDEO DECODER
402a
1st VIDEO DECODER
402c
1-1 VIDEO DECODER
1-2 VIDEO DECODER
402d
402b
2nd VIDEO DECODER
SUMMER
(HDTV)
(EDTV)
(LDTV)
757
OUTPUT SECTION
758
1st DATA STREAM OUTPUT
758c
ECC HIGH GAIN
758a
ECC NORMAL GAIN
758b
TDM
759
2nd DATA STREAM OUTPUT
759b
ECC
759a
TRELLIS DECODER
OFDM-CCDM-DEMODULATOR
852b
852a
C-CDM DEMODULATOR
45a
1/2 C-CDM DEMOD.
C-CDM DEMOD.
C-CDM DEMOD.
C-CDM DEMOD.
45c
45b
40a
40c
FFT
CONVERTOR
43
24
INPUT CIR
24a
DOWN CONVERTOR
RECEIVED SIGNAL

FIG. 124

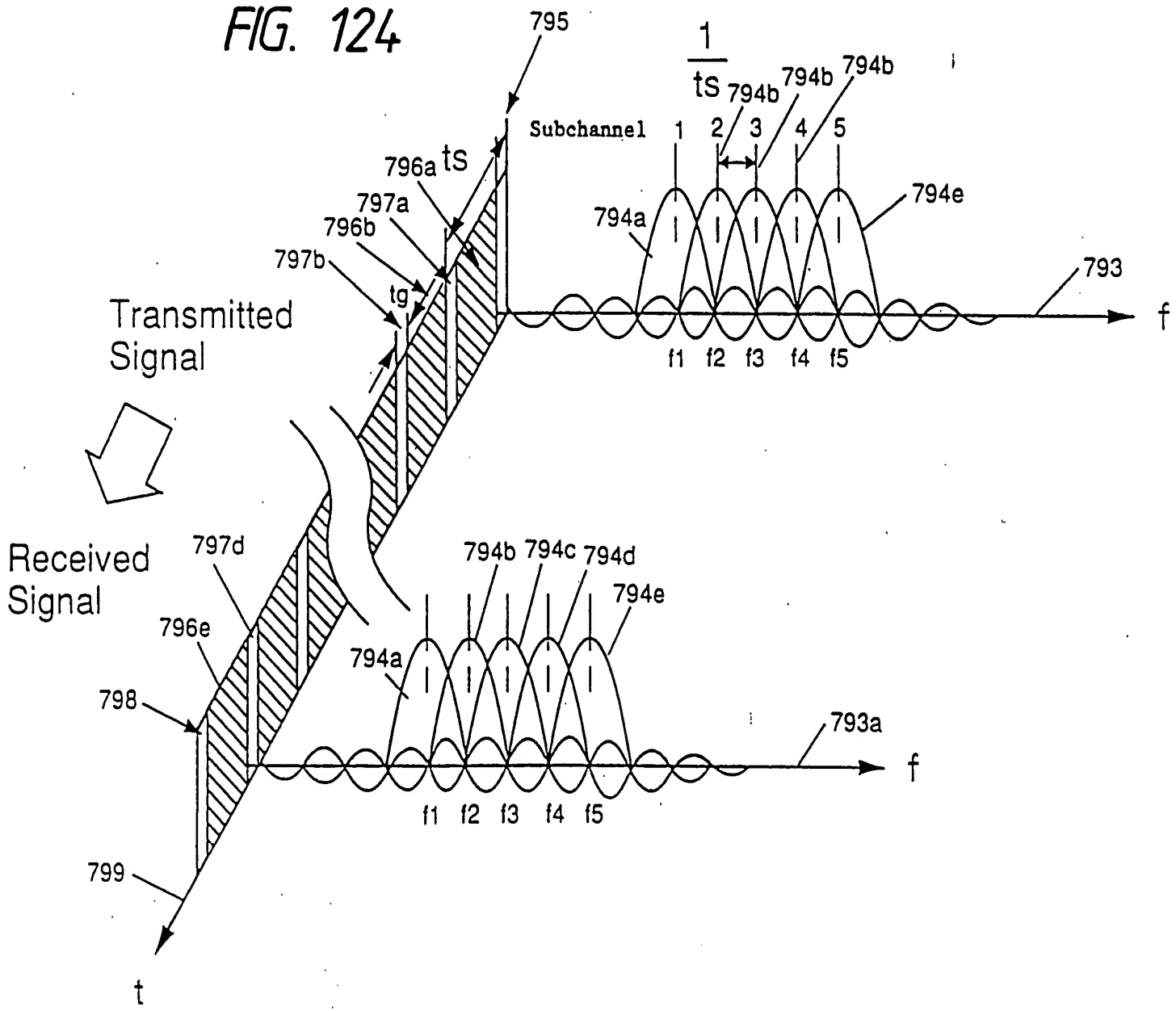
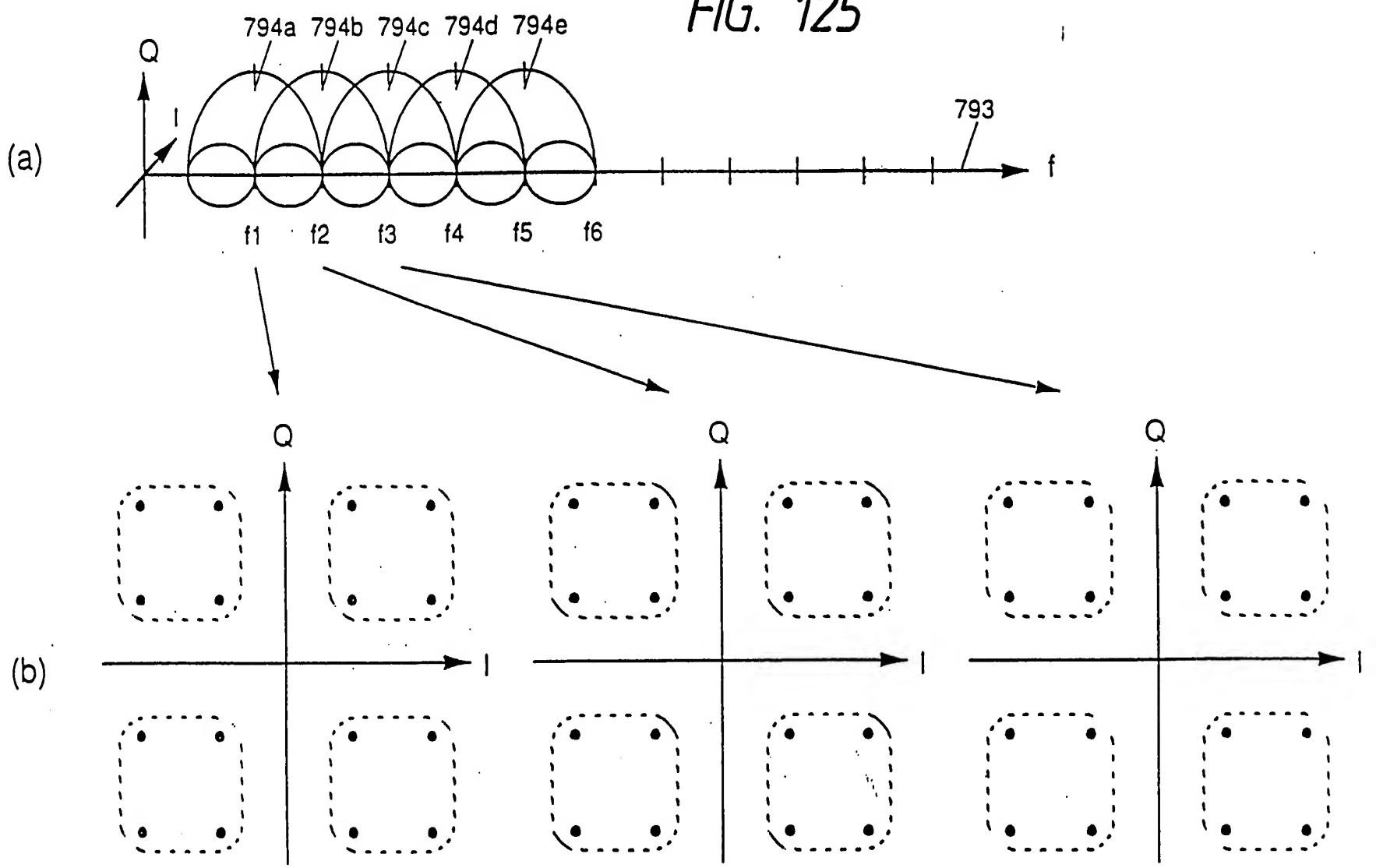

795
1/tS
794b
794b
794b
Subchannel
1
2
3
4
5
796a
tS
797a
796b
797b
tg
794a
794e
793
f
f1
f2
f3
f4
f5
Transmitted Signal
Received Signal
797d
794b
794c
794d
794e
796e
794a
798
793a
f
f1
f2
f3
f4
f5
799
t

FIG. 125



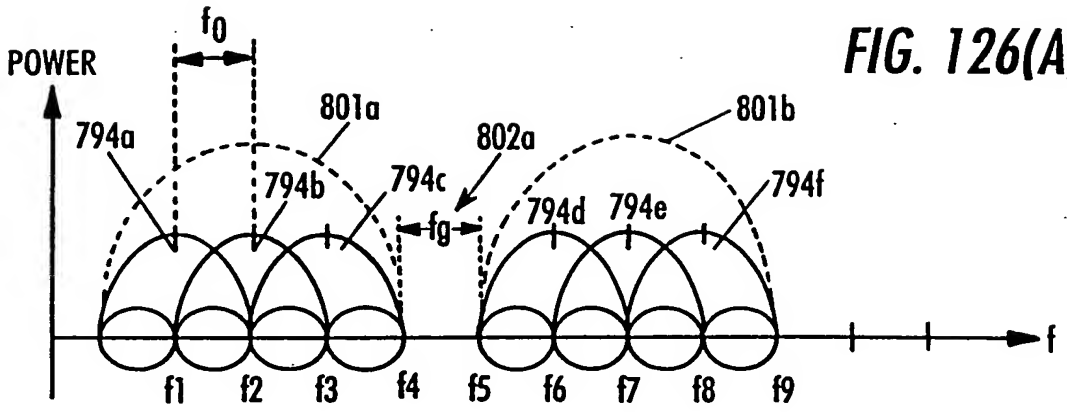


FIG. 126(A)

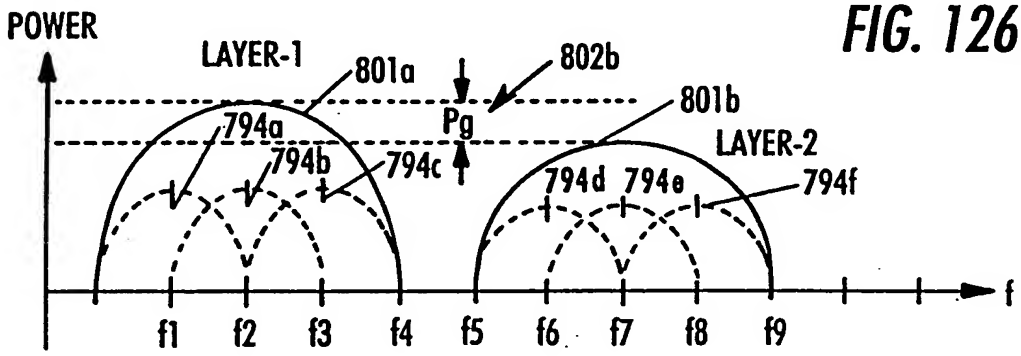


FIG. 126(B)

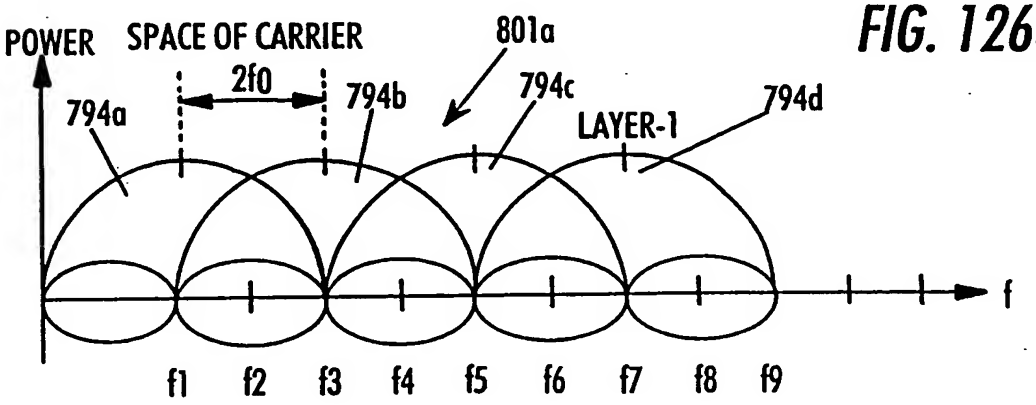


FIG. 126(C)

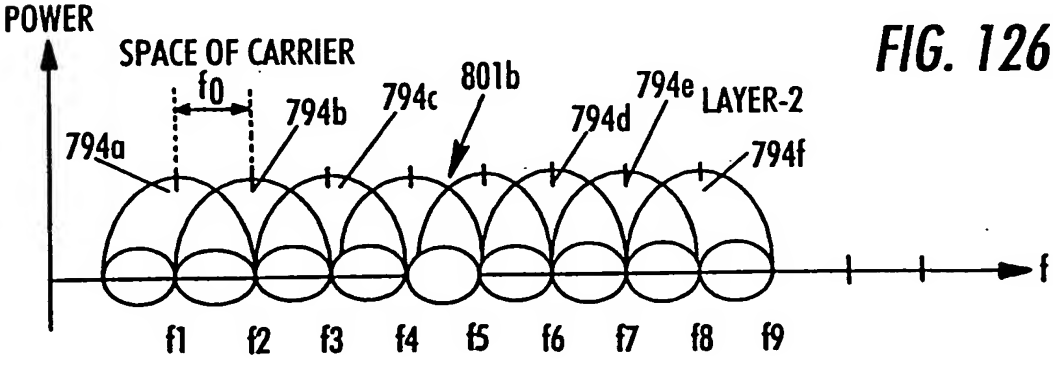


FIG. 126(D)

FIG. 127

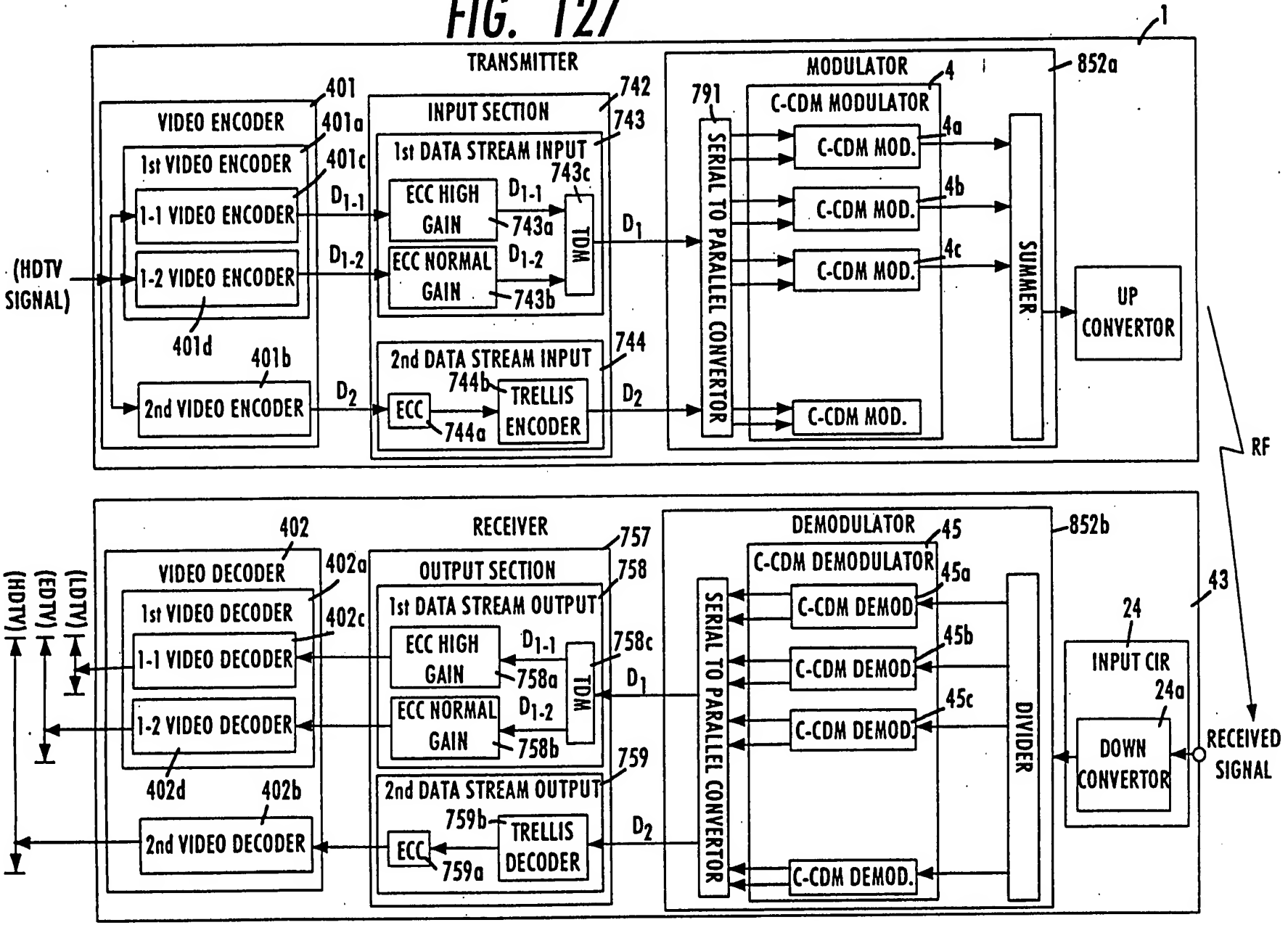

1
TRANSMITTER
MODULATOR
852a
4
401
VIDEO ENCODER
401a
1st VIDEO ENCODER
401c
1-1 VIDEO ENCODER
1-2 VIDEO ENCODER
401d
401b
2nd VIDEO ENCODER
(HDTV SIGNAL)
742
INPUT SECTION
743
1st DATA STREAM INPUT
743c
ECC HIGH GAIN
743a
ECC NORMAL GAIN
743b
TDM
744
2nd DATA STREAM INPUT
744b
ECC
744a
TRELLIS ENCODER
791
SERIAL TO PARALLEL CONVERTOR
C-CDM MODULATOR
C-CDM MOD.
4a
4b
4c
SUMMER
UP CONVERTOR
RF
RECEIVER
DEMODULATOR
852b
45
402
VIDEO DECODER
402a
1st VIDEO DECODER
402c
1-1 VIDEO DECODER
1-2 VIDEO DECODER
402d
402b
2nd VIDEO DECODER
(HDTV)
(EDTV)
(LDTV)
757
OUTPUT SECTION
758
1st DATA STREAM OUTPUT
758c
758a
758b
759
2nd DATA STREAM OUTPUT
759b
ECC
759a
TRELLIS DECODER
C-CDM DEMODULATOR
45a
45b
45c
C-CDM DEMOD
C-CDM DEMOD.
DIVIDER
43
24
INPUT CIR
24a
DOWN CONVERTOR
RECEIVED SIGNAL

FIG. 128

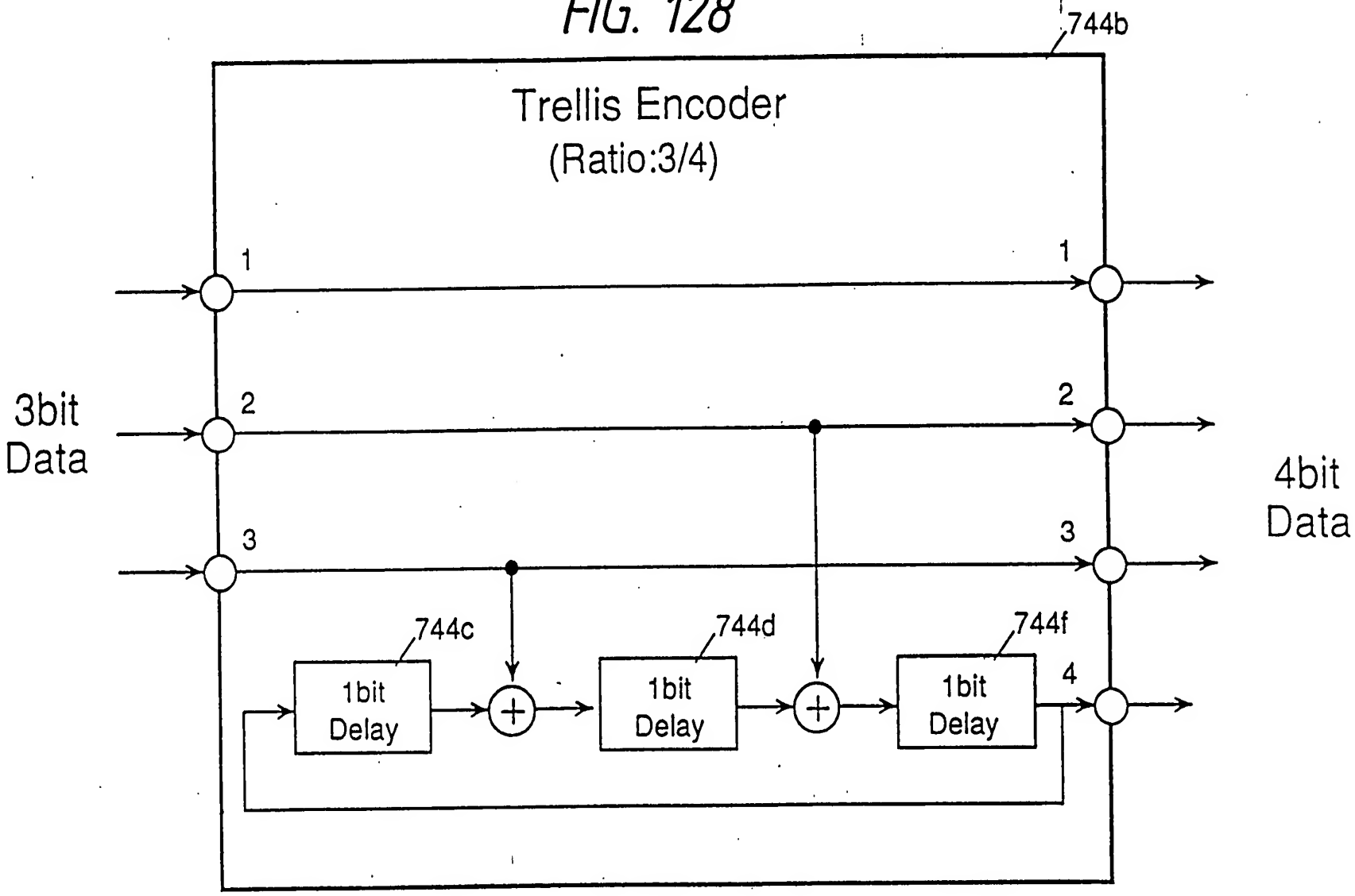

744b
Trellis Encoder
(Ratio:3/4)
3bit
Data
1
2
3
1
2
3
4
4bit
Data
744c
744d
744f
1bit
Delay
1bit
Delay
1bit
Delay

FIG. 129

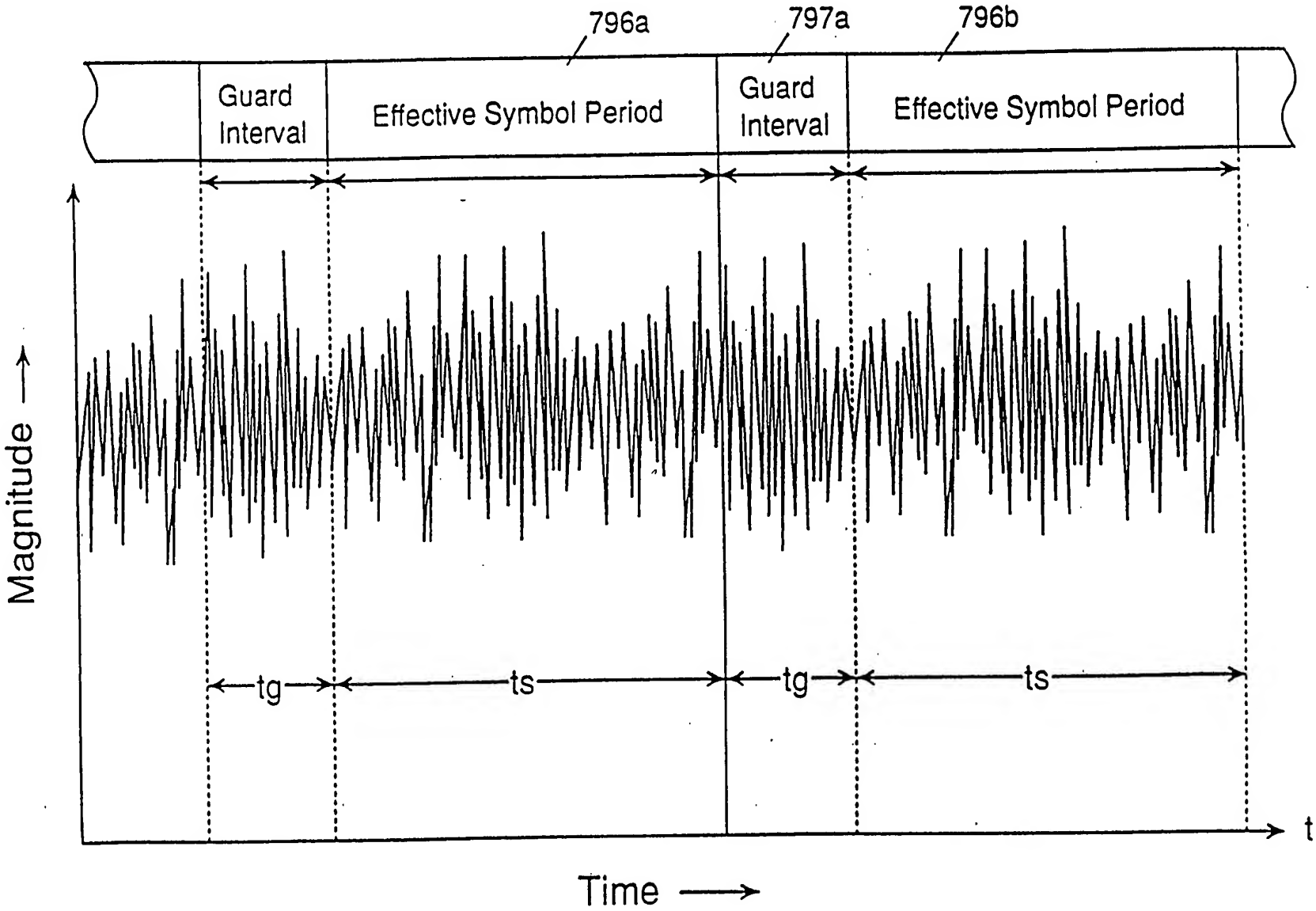
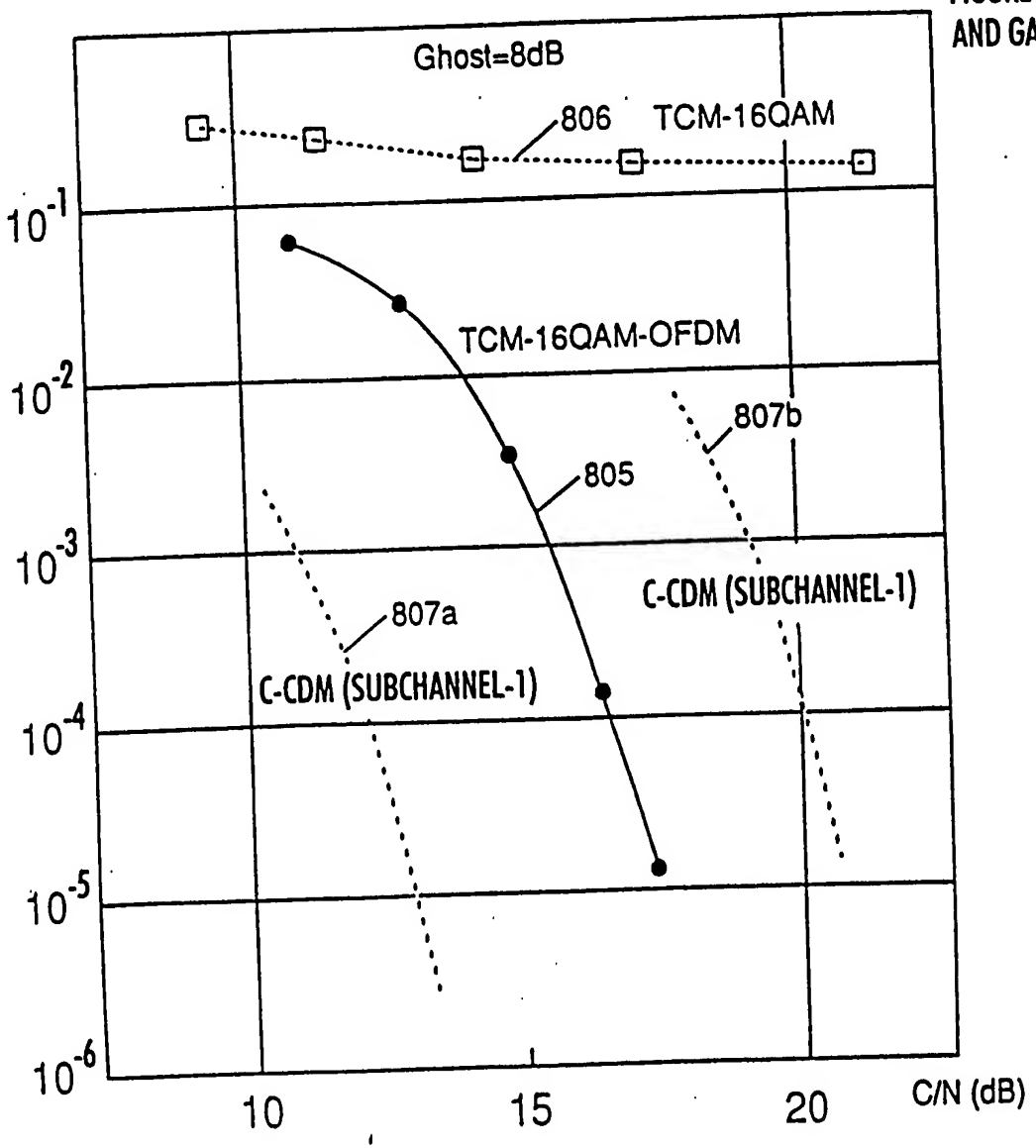

796a
797a
796b
Guard Interval
Effective Symbol Period
Guard Interval
Effective Symbol Period
Magnitude
tg
ts
tg
ts
t
Time

FIG. 130



GHOST DELAY=2us. D/U=8dB
FIGURE 8 BIT ERROR RATE PERFORMANCE UNDER SINGLE GHOST AND GAUSSIAN NOISE (1)

FIG. 131

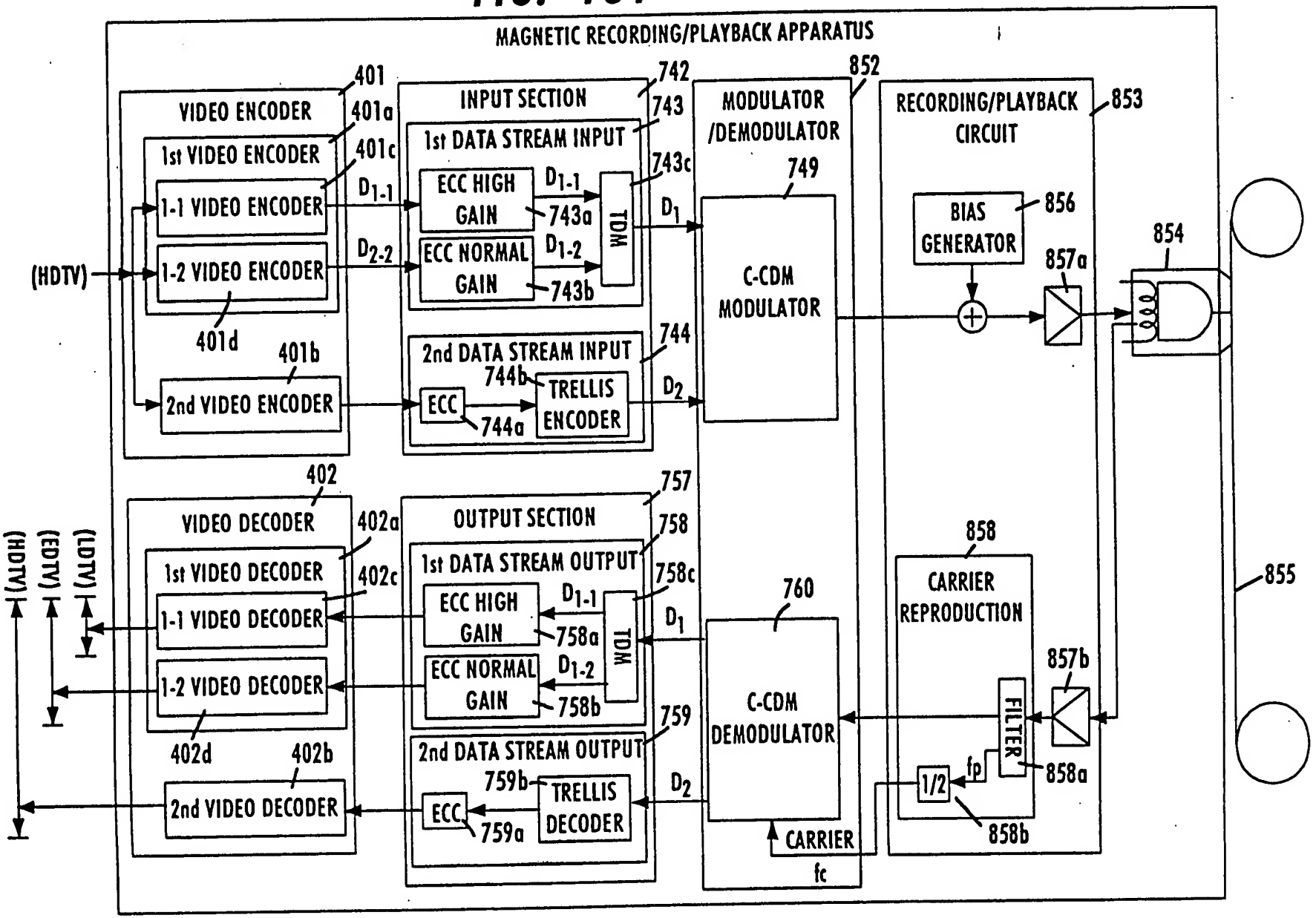

MAGNETIC RECORDING/PLAYBACK APPARATUS
VIDEO ENCODER
401
401a
1st VIDEO ENCODER
401c
1-1 VIDEO ENCODER
1-2 VIDEO ENCODER
401d
401b
2nd VIDEO ENCODER
(HDTV)
INPUT SECTION
742
743
1st DATA STREAM INPUT
743c
ECC HIGH GAIN
743a
ECC NORMAL GAIN
743b
TDM
2nd DATA STREAM INPUT
744
744b
ECC
744a
TRELLIS ENCODER
MODULATOR /DEMODULATOR
852
749
C-CDM MODULATOR
RECORDING/PLAYBACK CIRCUIT
853
BIAS GENERATOR
856
857a
854
855
VIDEO DECODER
402
402a
1st VIDEO DECODER
402c
1-1 VIDEO DECODER
1-2 VIDEO DECODER
402d
402b
2nd VIDEO DECODER
OUTPUT SECTION
757
758
1st DATA STREAM OUTPUT
758c
ECC HIGH GAIN
758a
ECC NORMAL GAIN
758b
TDM
2nd DATA STREAM OUTPUT
759
759b
ECC
759a
TRELLIS DECODER
760
C-CDM DEMODULATOR
CARRIER
fc
858
CARRIER REPRODUCTION
857b
FILTER
858a
1/2
fp
858b
(HDTV)
(EDTV)
(LDTV)

FIG. 132

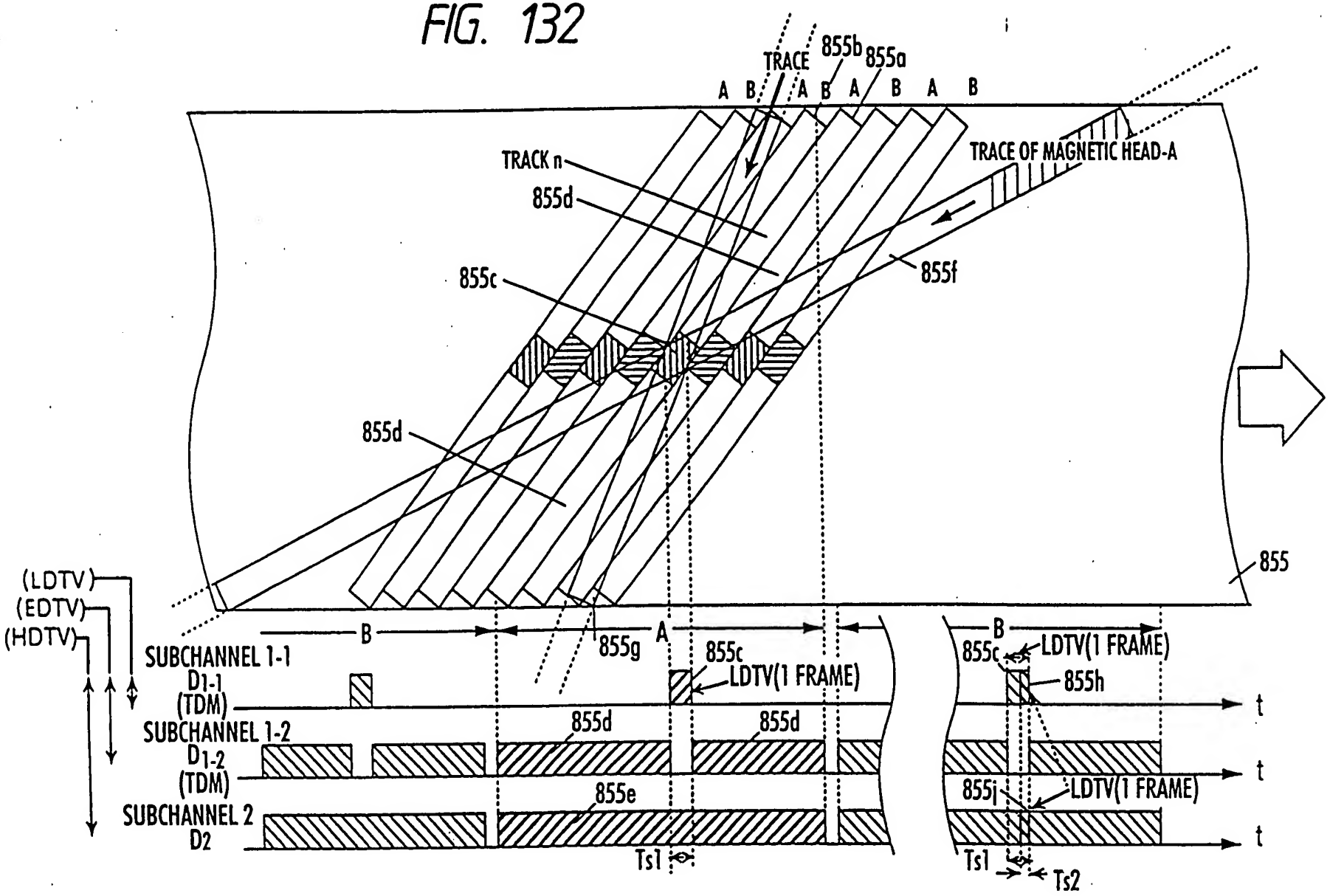

TRACE
855b
855a
A B A B A B A B
TRACK n
855d
TRACE OF MAGNETIC HEAD-A
855f
855c
855d
855
(LDTV)
(EDTV)
(HDTV)
B
A
855g
855c
LDTV(1 FRAME)
SUBCHANNEL 1-1
D1-1
(TDM)
SUBCHANNEL 1-2
D1-2
(TDM)
855d
855d
SUBCHANNEL 2
D2
855e
Ts1
B
855c
LDTV(1 FRAME)
855h
t
t
855j
LDTV(1 FRAME)
t
Ts1
Ts2

FIG. 133

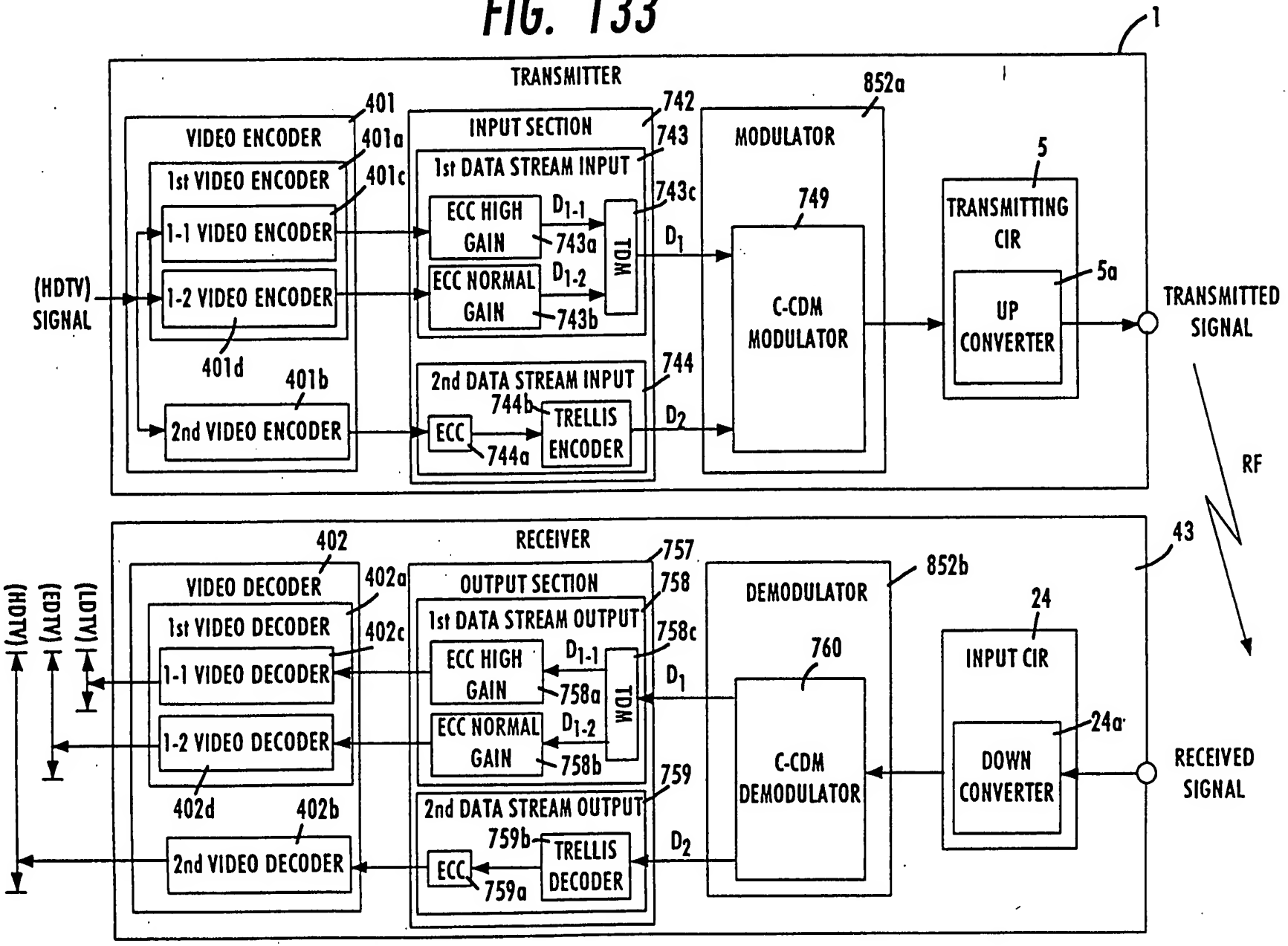

1
TRANSMITTER
401
VIDEO ENCODER
401a
1st VIDEO ENCODER
401c
1-1 VIDEO ENCODER
1-2 VIDEO ENCODER
401d
401b
2nd VIDEO ENCODER
(HDTV) SIGNAL
742
INPUT SECTION
743
1st DATA STREAM INPUT
ECC HIGH GAIN
D_{1-1}
743a
ECC NORMAL GAIN
D_{1-2}
743b
TDM
743c
D_1
744
2nd DATA STREAM INPUT
744b
ECC
744a
TRELLIS ENCODER
D_2
852a
MODULATOR
749
C-CDM MODULATOR
5
TRANSMITTING CIR
5a
UP CONVERTER
TRANSMITTED SIGNAL
RF
43
RECEIVER
402
VIDEO DECODER
402a
1st VIDEO DECODER
402c
1-1 VIDEO DECODER
1-2 VIDEO DECODER
402d
402b
2nd VIDEO DECODER
(HDTV)
(EDTV)
(LDTV)
757
OUTPUT SECTION
758
1st DATA STREAM OUTPUT
758c
ECC HIGH GAIN
D_{1-1}
758a
ECC NORMAL GAIN
D_{1-2}
758b
TDM
D_1
759
2nd DATA STREAM OUTPUT
759b
ECC
759a
TRELLIS DECODER
D_2
852b
DEMODULATOR
760
C-CDM DEMODULATOR
24
INPUT CIR
24a
DOWN CONVERTER
RECEIVED SIGNAL

FIG. 134

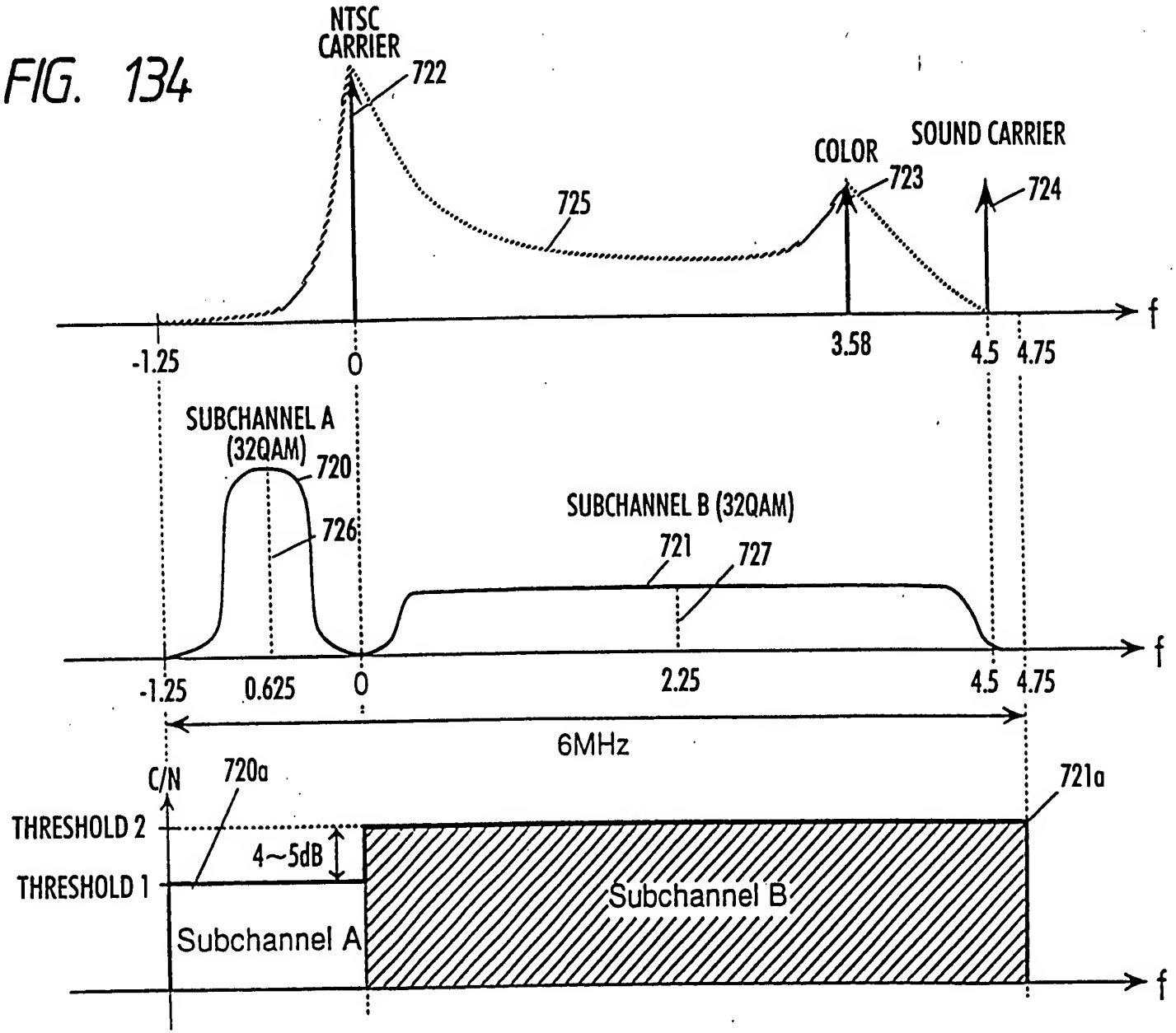

NTSC CARRIER
722
COLOR
723
SOUND CARRIER
724
725
f
-1.25
0
3.58
4.5
4.75
SUBCHANNEL A (32QAM)
720
726
SUBCHANNEL B (32QAM)
721
727
f
-1.25
0.625
0
2.25
4.5
4.75
6MHz
C/N
720a
721a
THRESHOLD 2
4~5dB
THRESHOLD 1
Subchannel A
Subchannel B
f

FIG. 135

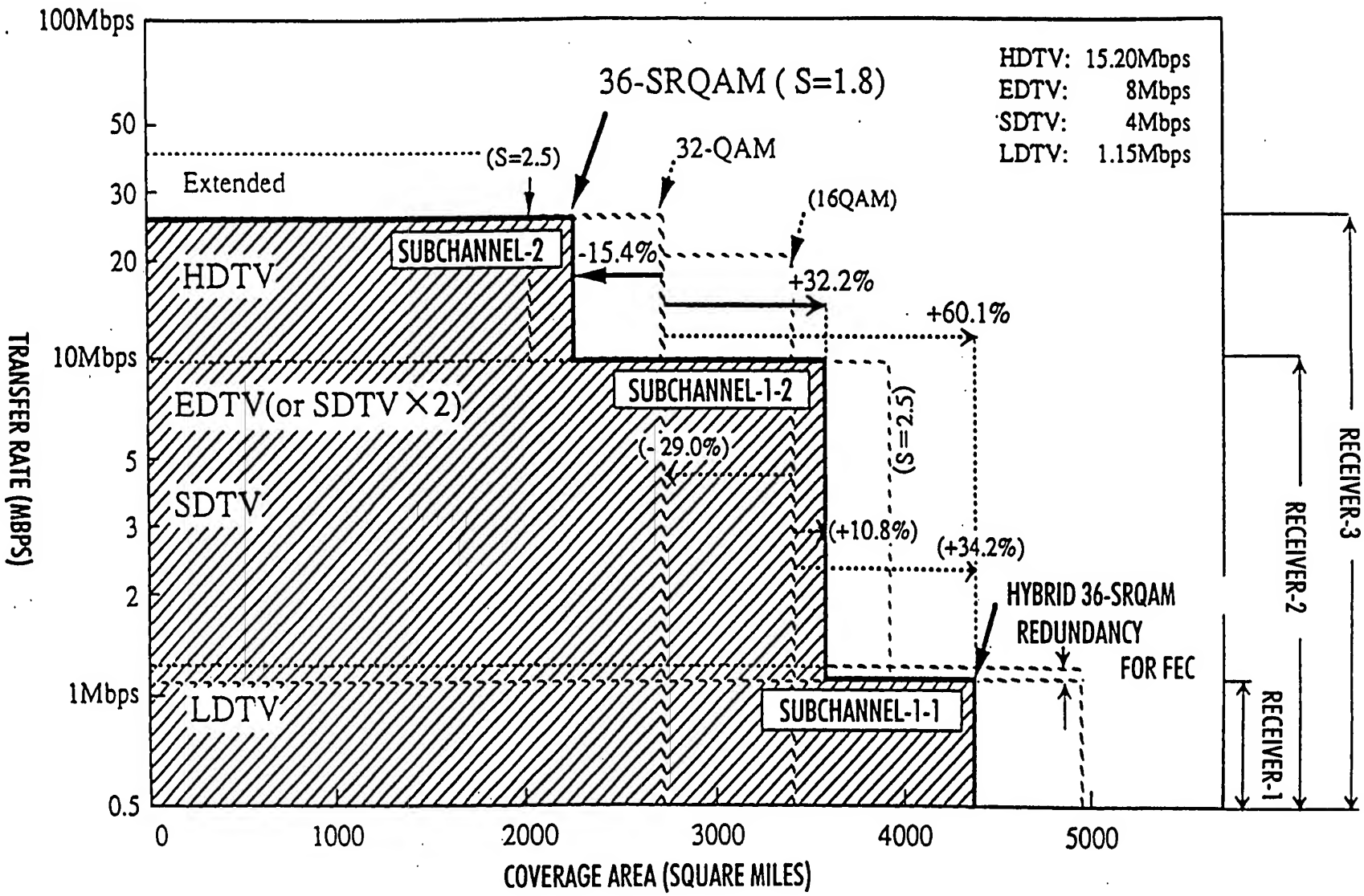

100Mbps
50
30
20
10Mbps
5
3
2
1Mbps
0.5
TRANSFER RATE (MBPS)
0
1000
2000
3000
4000
5000
COVERAGE AREA (SQUARE MILES)
36-SRQAM (S=1.8)
HDTV: 15.20Mbps
EDTV: 8Mbps
SDTV: 4Mbps
LDTV: 1.15Mbps
(S=2.5)
Extended
32-QAM
(16QAM)
SUBCHANNEL-2
-15.4%
+32.2%
+60.1%
HDTV
EDTV(or SDTV×2)
SDTV
LDTV
SUBCHANNEL-1-2
(- 29.0%)
(S=2.5)
(+10.8%)
(+34.2%)
HYBRID 36-SRQAM
REDUNDANCY
FOR FEC
SUBCHANNEL-1-1
RECEIVER-3
RECEIVER-2
RECEIVER-1

FIG. 136

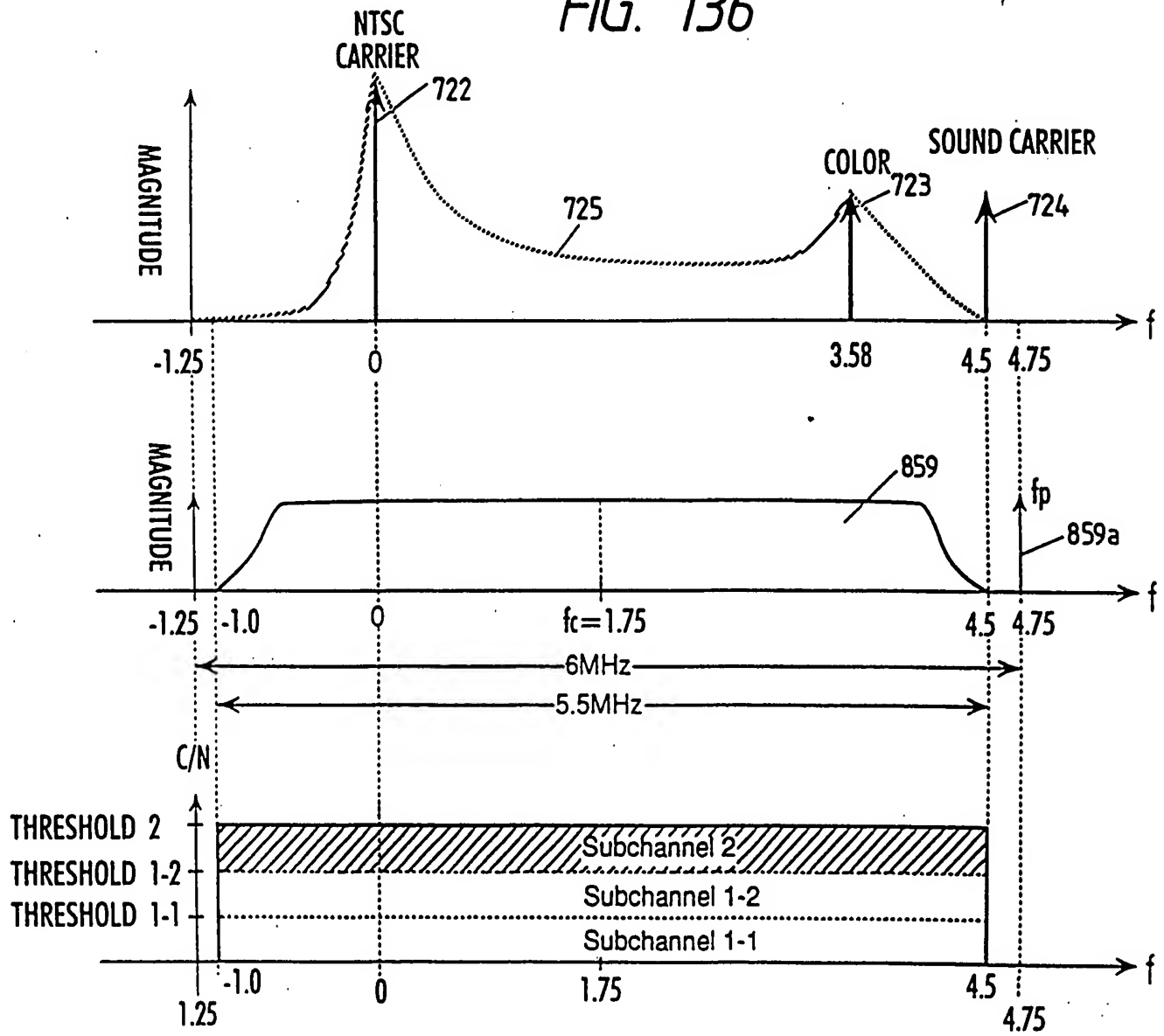

NTSC CARRIER
722
MAGNITUDE
725
COLOR
723
SOUND CARRIER
724
f
-1.25
0
3.58
4.5
4.75
MAGNITUDE
859
fp
859a
f
-1.25
-1.0
0
fc=1.75
4.5
4.75
6MHz
5.5MHz
C/N
THRESHOLD 2
THRESHOLD 1-2
THRESHOLD 1-1
Subchannel 2
Subchannel 1-2
Subchannel 1-1
f
-1.0
0
1.75
4.5
1.25
4.75

FIG. 137

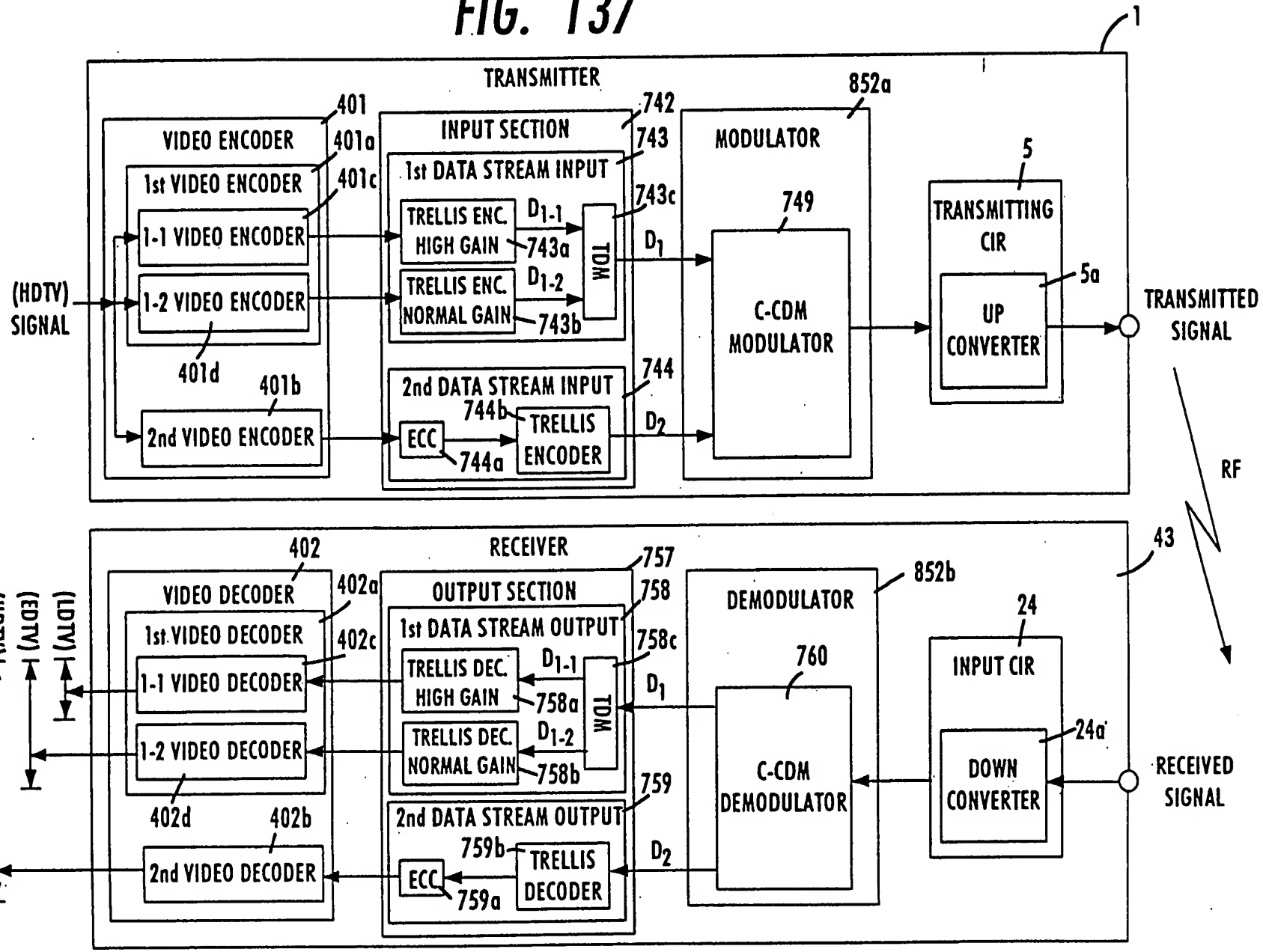

1
TRANSMITTER
401
VIDEO ENCODER
401a
1st VIDEO ENCODER
401c
1-1 VIDEO ENCODER
1-2 VIDEO ENCODER
401d
401b
2nd VIDEO ENCODER
(HDTV) SIGNAL
742
INPUT SECTION
743
1st DATA STREAM INPUT
TRELLIS ENC. HIGH GAIN
743a
D1-1
TRELLIS ENC. NORMAL GAIN
743b
D1-2
TDM
743c
D1
744
2nd DATA STREAM INPUT
744b
ECC
744a
TRELLIS ENCODER
D2
852a
MODULATOR
749
C-CDM MODULATOR
5
TRANSMITTING CIR
5a
UP CONVERTER
TRANSMITTED SIGNAL
RF
43
RECEIVER
402
VIDEO DECODER
402a
1st VIDEO DECODER
402c
1-1 VIDEO DECODER
1-2 VIDEO DECODER
402d
402b
2nd VIDEO DECODER
(HDTV)
(SDTV)
(LDTV)
757
OUTPUT SECTION
758
1st DATA STREAM OUTPUT
TRELLIS DEC. HIGH GAIN
758a
D1-1
TRELLIS DEC. NORMAL GAIN
758b
D1-2
TDM
758c
D1
759
2nd DATA STREAM OUTPUT
759b
ECC
759a
TRELLIS DECODER
D2
852b
DEMODULATOR
760
C-CDM DEMODULATOR
24
INPUT CIR
24a
DOWN CONVERTER
RECEIVED SIGNAL

FIG. 138

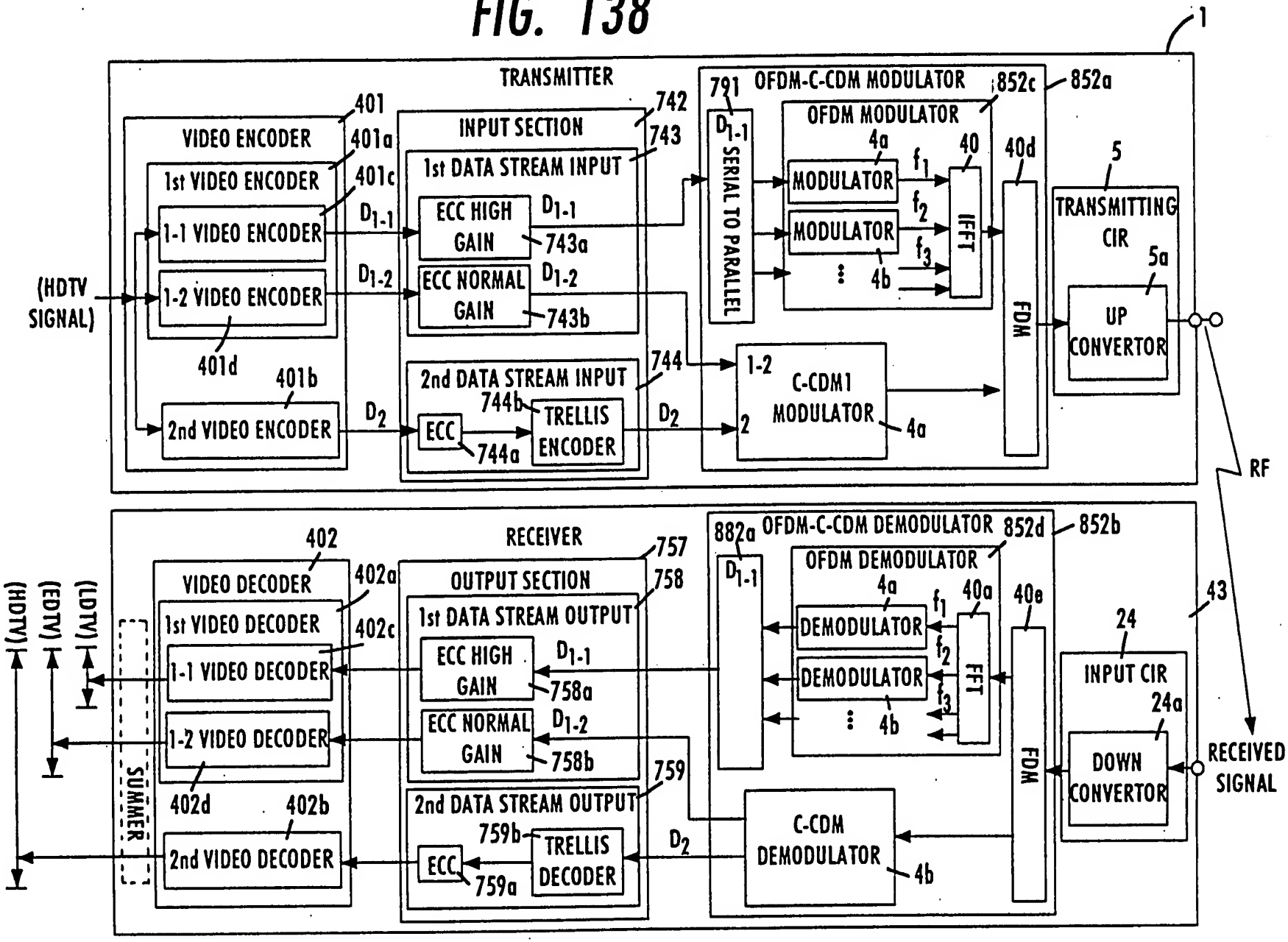

1
TRANSMITTER
401
VIDEO ENCODER
401a
1st VIDEO ENCODER
401c
1-1 VIDEO ENCODER
1-2 VIDEO ENCODER
401d
401b
2nd VIDEO ENCODER
(HDTV SIGNAL)
D1-1
D1-2
D2
742
INPUT SECTION
743
1st DATA STREAM INPUT
ECC HIGH GAIN
743a
ECC NORMAL GAIN
743b
2nd DATA STREAM INPUT
744
744b
ECC
744a
TRELLIS ENCODER
791
D1-1 SERIAL TO PARALLEL
OFDM-C-CDM MODULATOR
852c
852a
OFDM MODULATOR
4a
MODULATOR
MODULATOR
4b
f1
f2
f3
40
IFFT
40d
FDM
1-2
C-CDM1 MODULATOR
2
4a
5
TRANSMITTING CIR
5a
UP CONVERTOR
RF
RECEIVER
402
VIDEO DECODER
402a
1st VIDEO DECODER
402c
1-1 VIDEO DECODER
1-2 VIDEO DECODER
402d
402b
2nd VIDEO DECODER
SUMMER
(HDTV)
(EDTV)
(LDTV)
757
OUTPUT SECTION
758
1st DATA STREAM OUTPUT
ECC HIGH GAIN
758a
ECC NORMAL GAIN
758b
2nd DATA STREAM OUTPUT
759
759b
ECC
759a
TRELLIS DECODER
882a
D1-1
OFDM-C-CDM DEMODULATOR
852d
852b
OFDM DEMODULATOR
4a
DEMODULATOR
DEMODULATOR
4b
f1
f2
f3
40a
FFT
40e
FDM
C-CDM DEMODULATOR
4b
43
24
INPUT CIR
24a
DOWN CONVERTOR
RECEIVED SIGNAL

FIG. 139

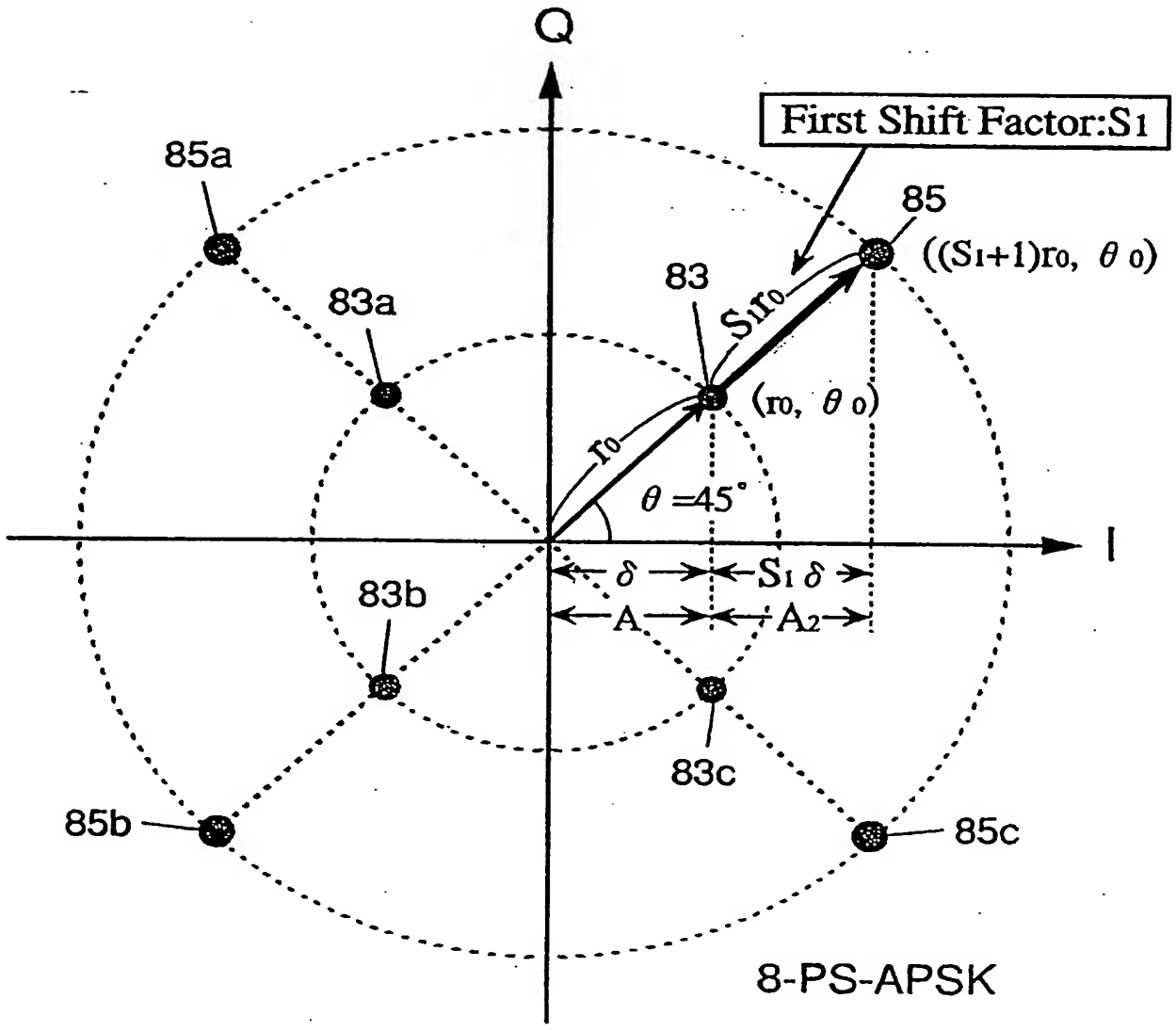

Q
I
First Shift Factor:S1
85a
85
((S1+1)r0, θ 0)
83
S1r0
83a
(r0, θ 0)
r0
θ =45°
δ
S1 δ
A
A2
83b
83c
85b
85c
8-PS-APSK

FIG. 140

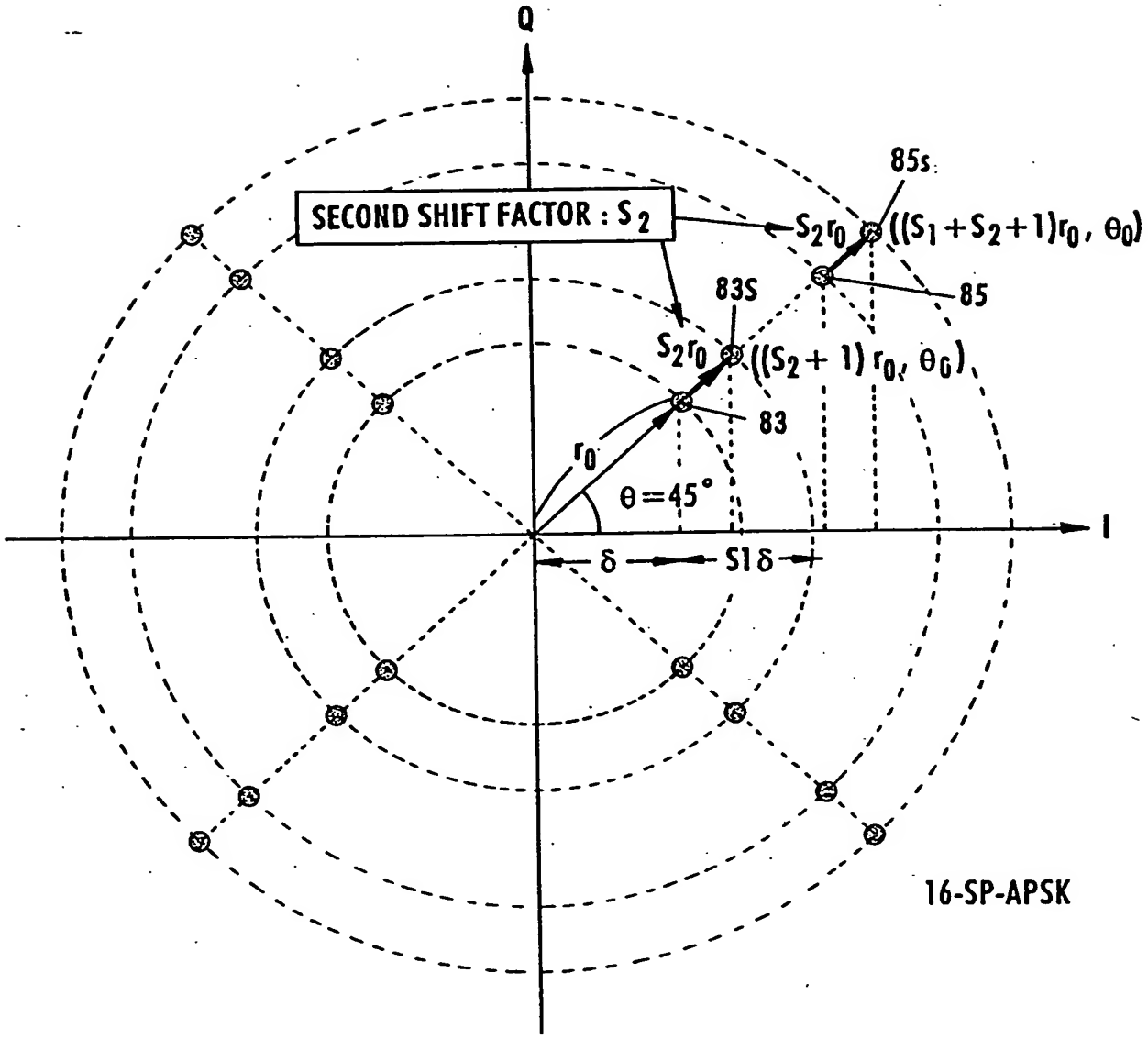

Q
I
SECOND SHIFT FACTOR : S_2
85s
S_2r_0
$((S_1+S_2+1)r_0, \theta_0)$
85
83S
S_2r_0
$((S_2+1)r_0, \theta_0)$
83
r_0
$\theta=45°$
δ
$S1\delta$
16-SP-APSK

FIG. 141

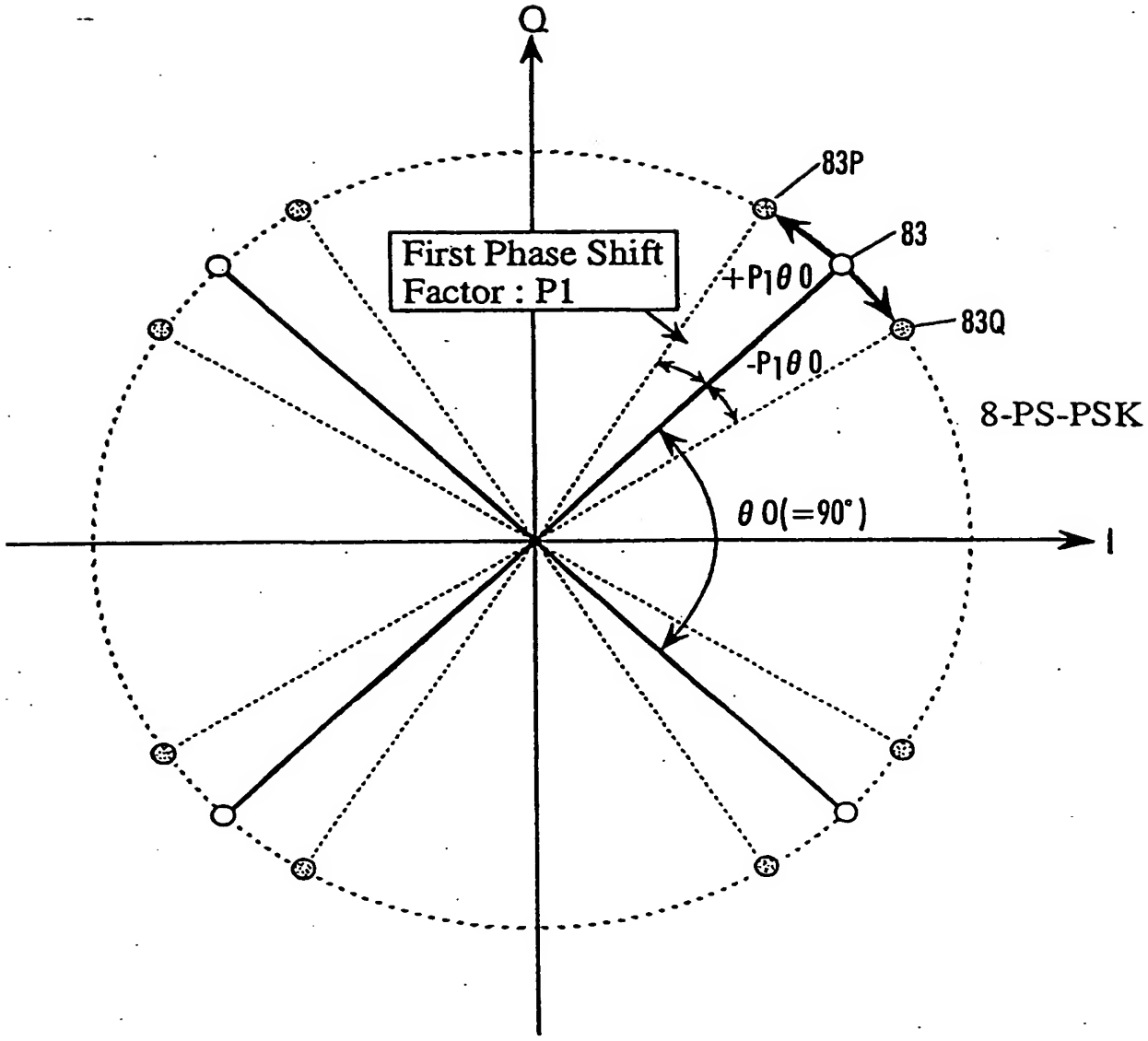

Q
I
83P
83
83Q
First Phase Shift
Factor : P1
+P1θ0
-P1θ0
θ0(=90°)
8-PS-PSK

FIG. 142

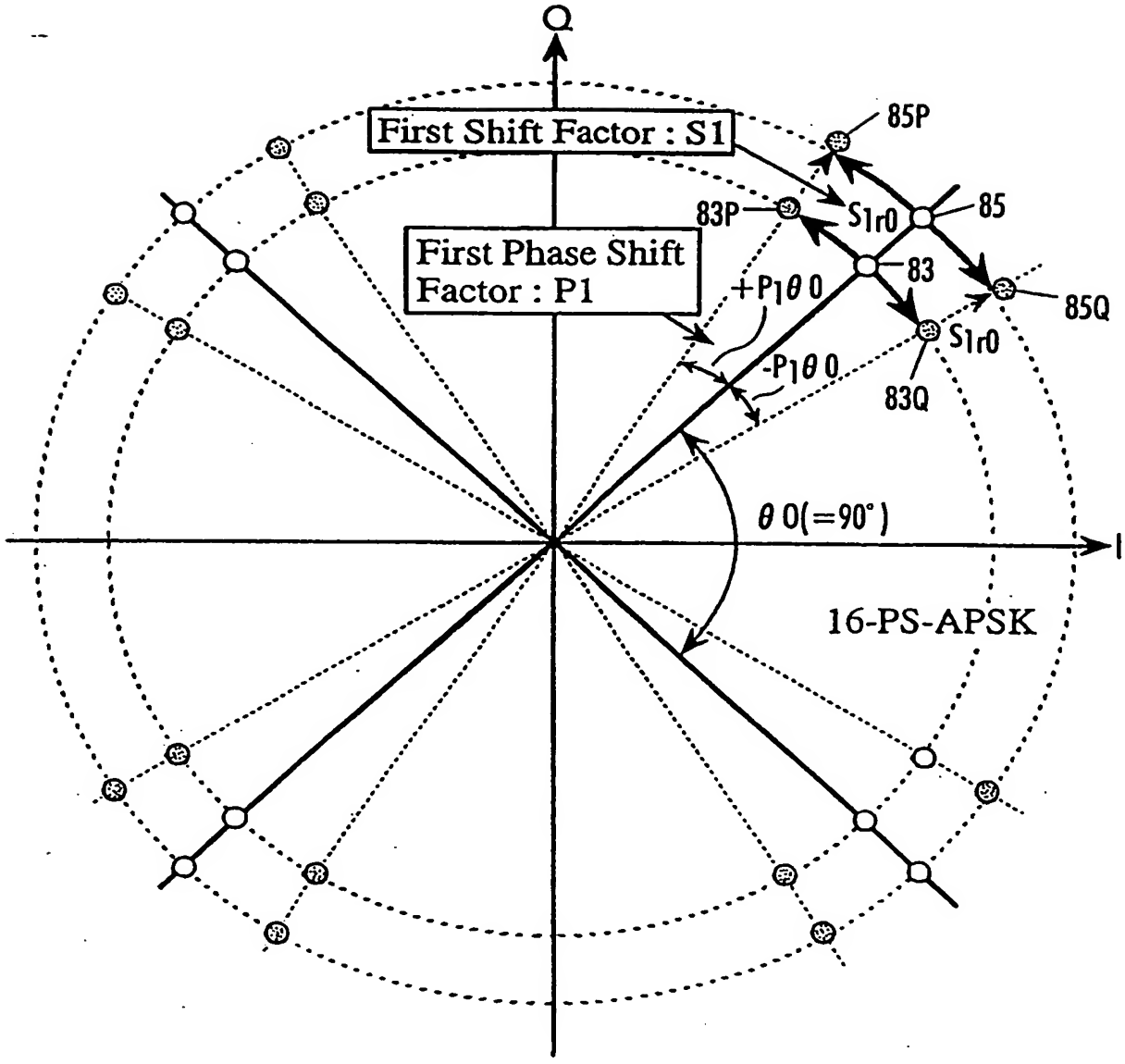

Q
First Shift Factor : S1
First Phase Shift Factor : P1
85P
83P
S1r0
85
83
+P1θ0
-P1θ0
85Q
S1r0
83Q
θ0(=90°)
I
16-PS-APSK

FIG. 143

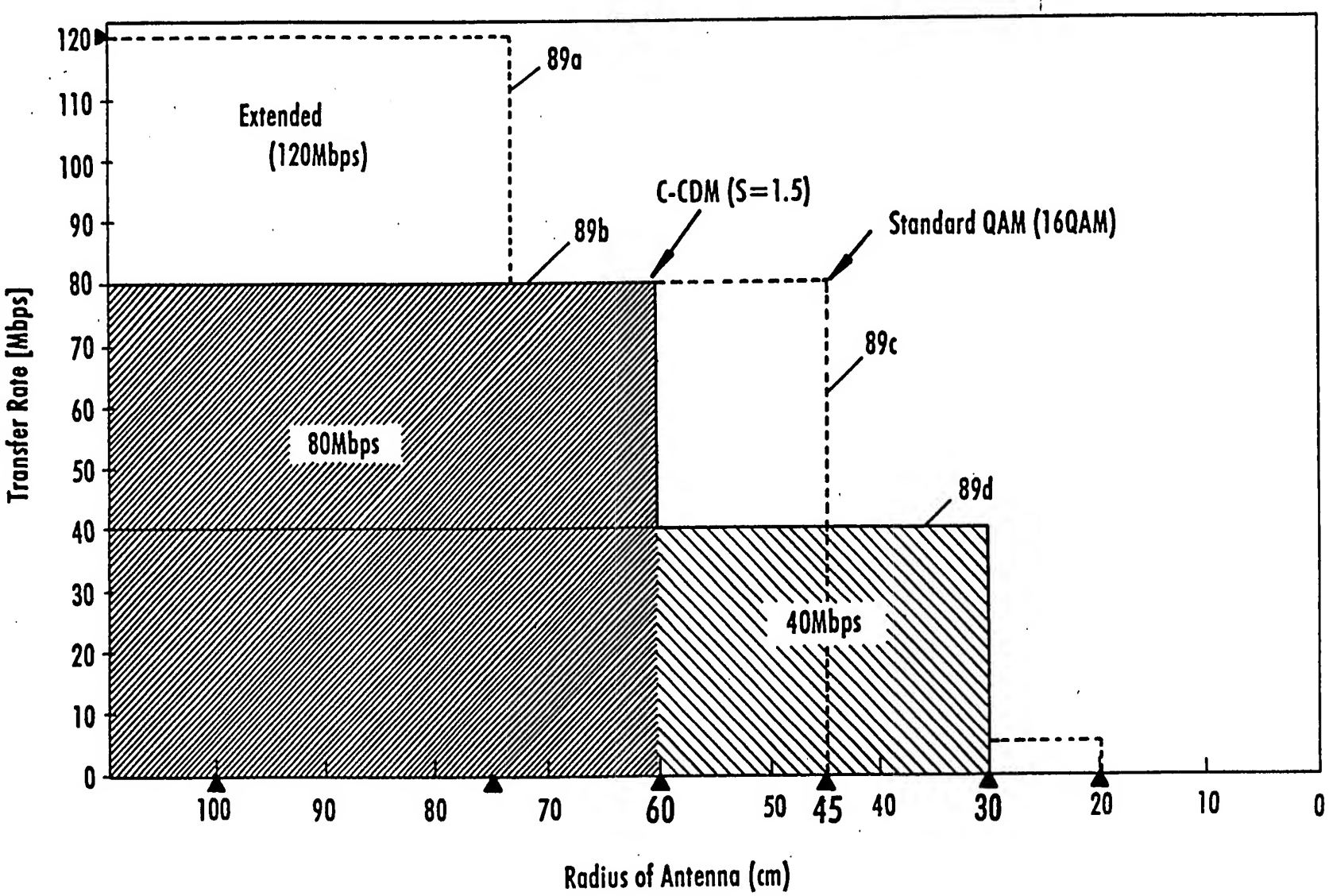

120
110
100
90
80
70
60
50
40
30
20
10
0
Transfer Rate [Mbps]
Extended
(120Mbps)
89a
89b
C-CDM (S=1.5)
Standard QAM (16QAM)
89c
89d
80Mbps
40Mbps
100
90
80
70
60
50
45
40
30
20
10
0
Radius of Antenna (cm)

FIG. 144

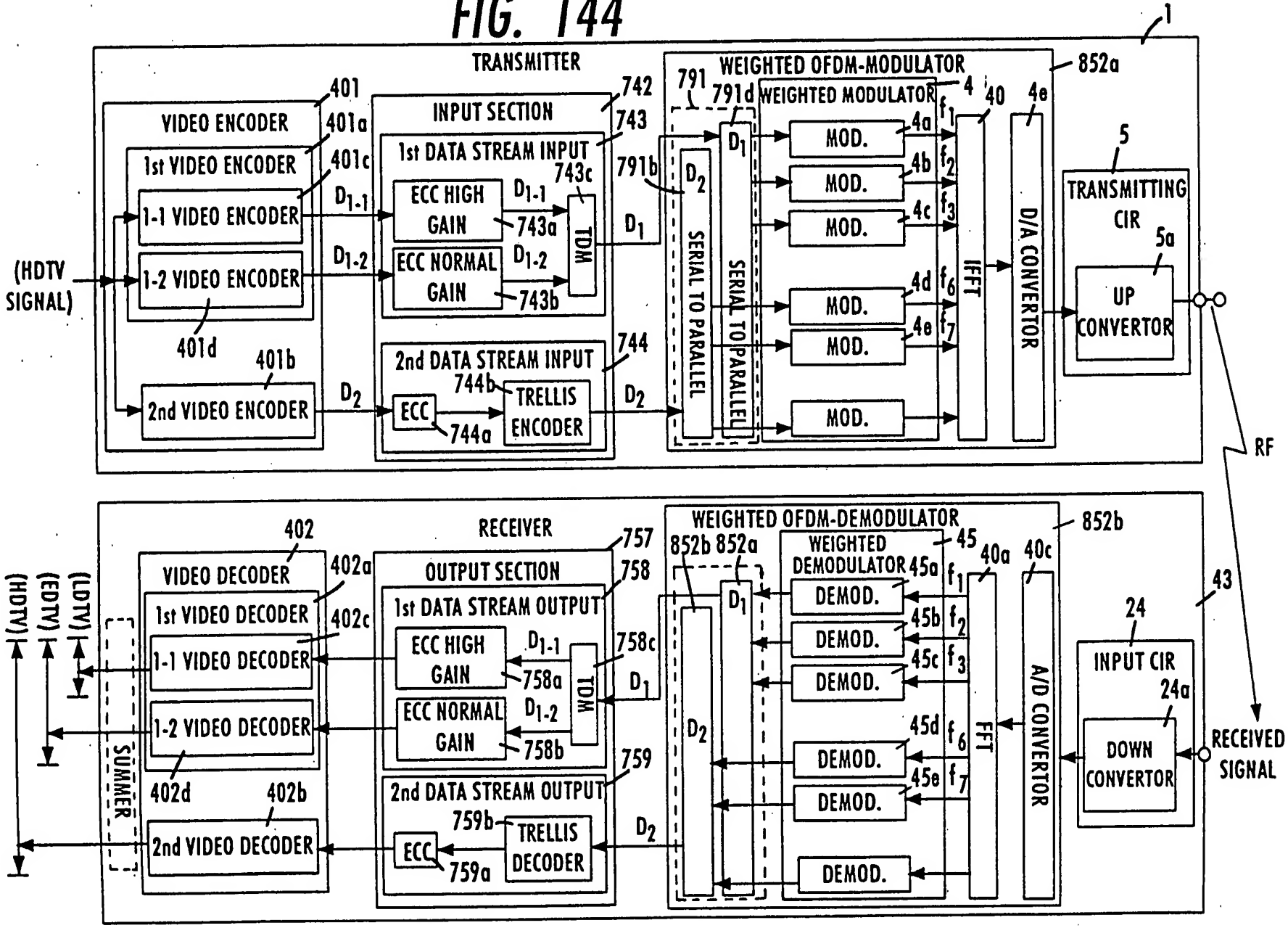

1
TRANSMITTER
WEIGHTED OFDM-MODULATOR
852a
401
VIDEO ENCODER
401a
1st VIDEO ENCODER
401c
1-1 VIDEO ENCODER
1-2 VIDEO ENCODER
401d
401b
2nd VIDEO ENCODER
(HDTV SIGNAL)
742
INPUT SECTION
743
1st DATA STREAM INPUT
743c
ECC HIGH GAIN
743a
ECC NORMAL GAIN
743b
TDM
744
2nd DATA STREAM INPUT
744b
ECC
744a
TRELLIS ENCODER
791
791d
791b
SERIAL TO PARALLEL
WEIGHTED MODULATOR
4
MOD.
4a
4b
4c
4d
4e
IFFT
40
4e
D/A CONVERTOR
5
TRANSMITTING CIR
5a
UP CONVERTOR
RF
RECEIVER
402
VIDEO DECODER
402a
1st VIDEO DECODER
402c
1-1 VIDEO DECODER
1-2 VIDEO DECODER
402d
402b
2nd VIDEO DECODER
SUMMER
(HDTV)
(EDTV)
(LDTV)
757
OUTPUT SECTION
758
1st DATA STREAM OUTPUT
758c
ECC HIGH GAIN
758a
ECC NORMAL GAIN
758b
TDM
759
2nd DATA STREAM OUTPUT
759b
ECC
759a
TRELLIS DECODER
WEIGHTED OFDM-DEMODULATOR
852b
852b 852a
WEIGHTED DEMODULATOR
45
45a
DEMOD.
45b
45c
45d
45e
FFT
40a
40c
A/D CONVERTOR
43
24
INPUT CIR
24a
DOWN CONVERTOR
RECEIVED SIGNAL

FIG. 145(A)

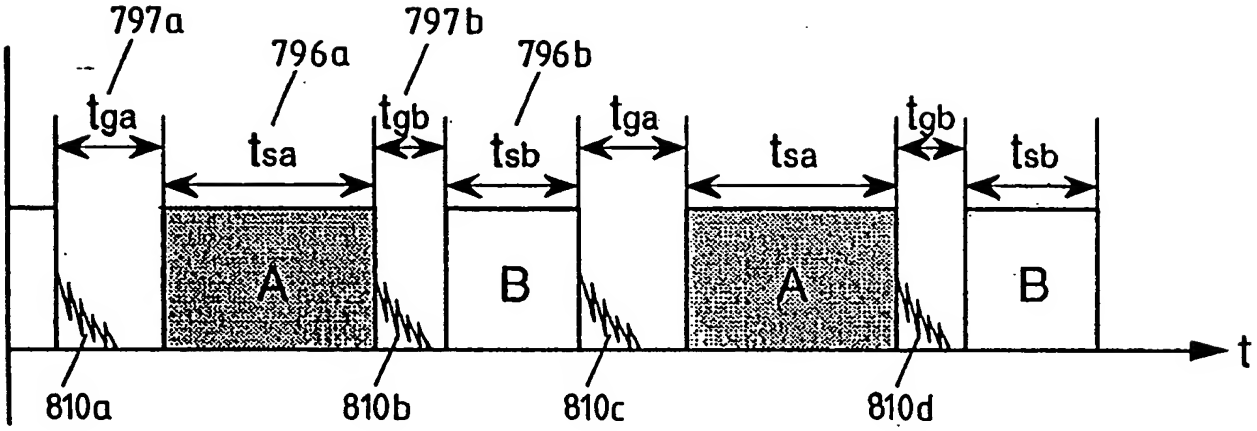


FIG. 145(B)

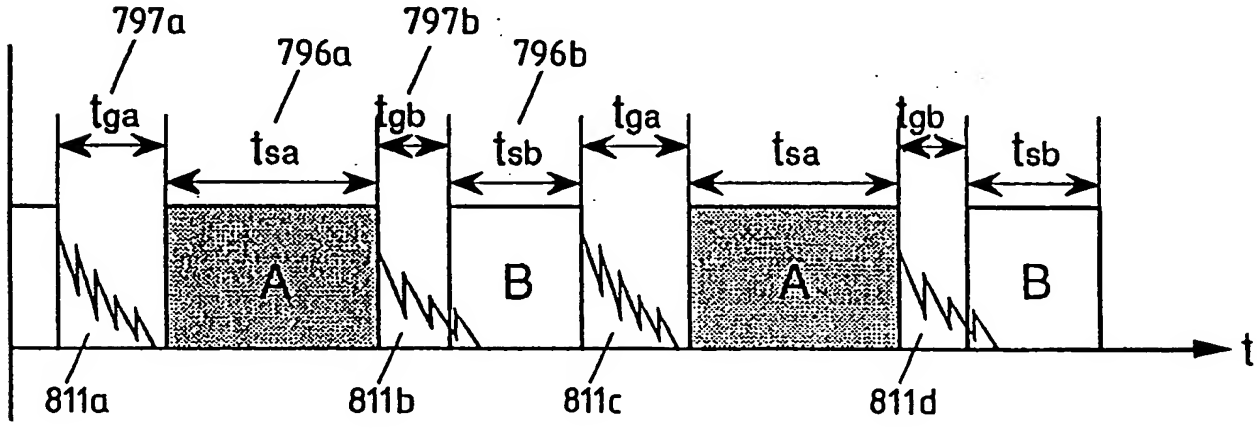
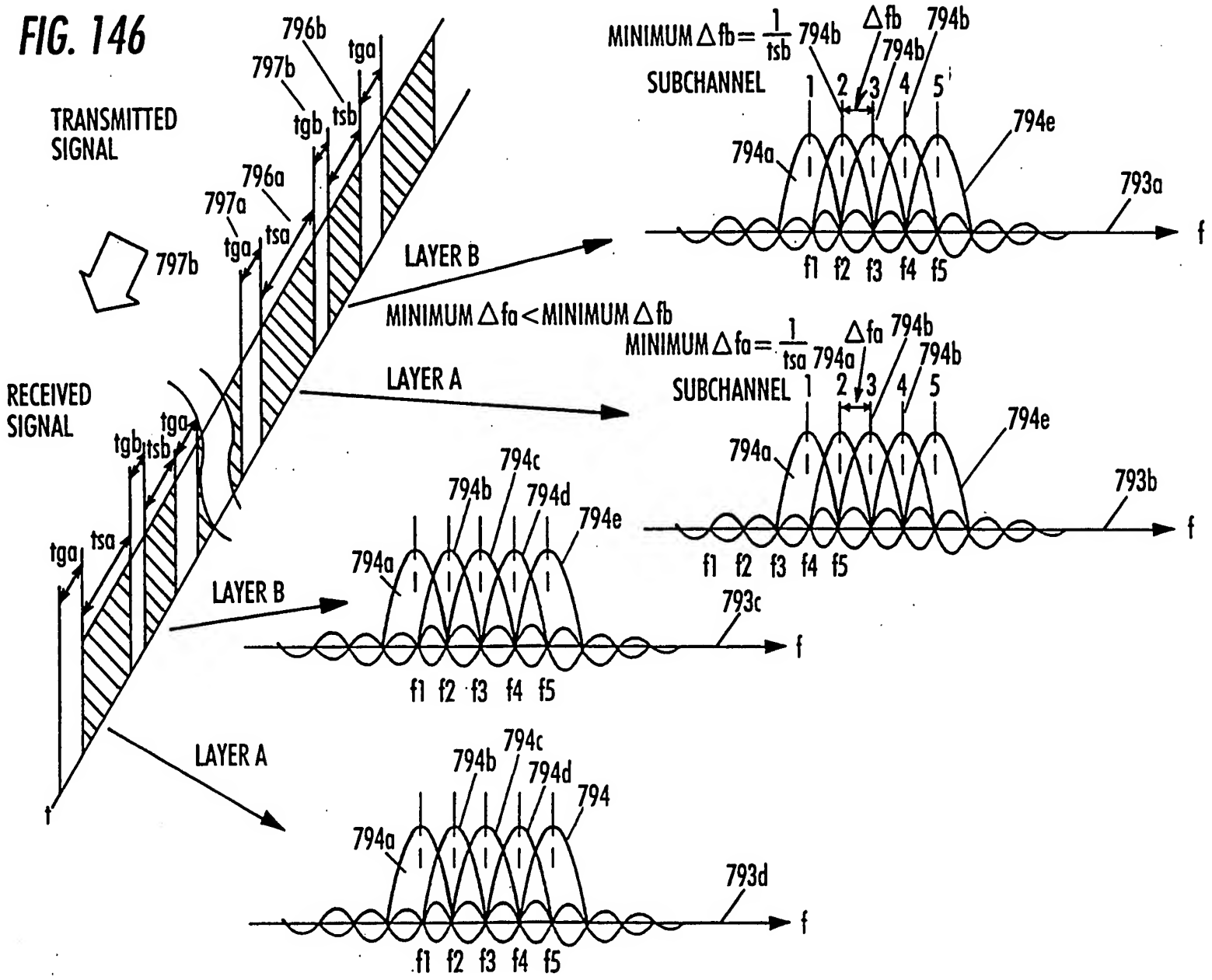


FIG. 146


TRANSMITTED SIGNAL
RECEIVED SIGNAL
796b
797b
tga
tgb
tsb
796a
797a
tsa
797b
LAYER B
LAYER A
MINIMUM Δfb = 1/tsb
MINIMUM Δfa = 1/tsa
MINIMUM Δfa < MINIMUM Δfb
SUBCHANNEL
1 2 3 4 5
Δfb
Δfa
794a
794b
794c
794d
794e
793a
793b
793c
793d
794
f
f1 f2 f3 f4 f5
t

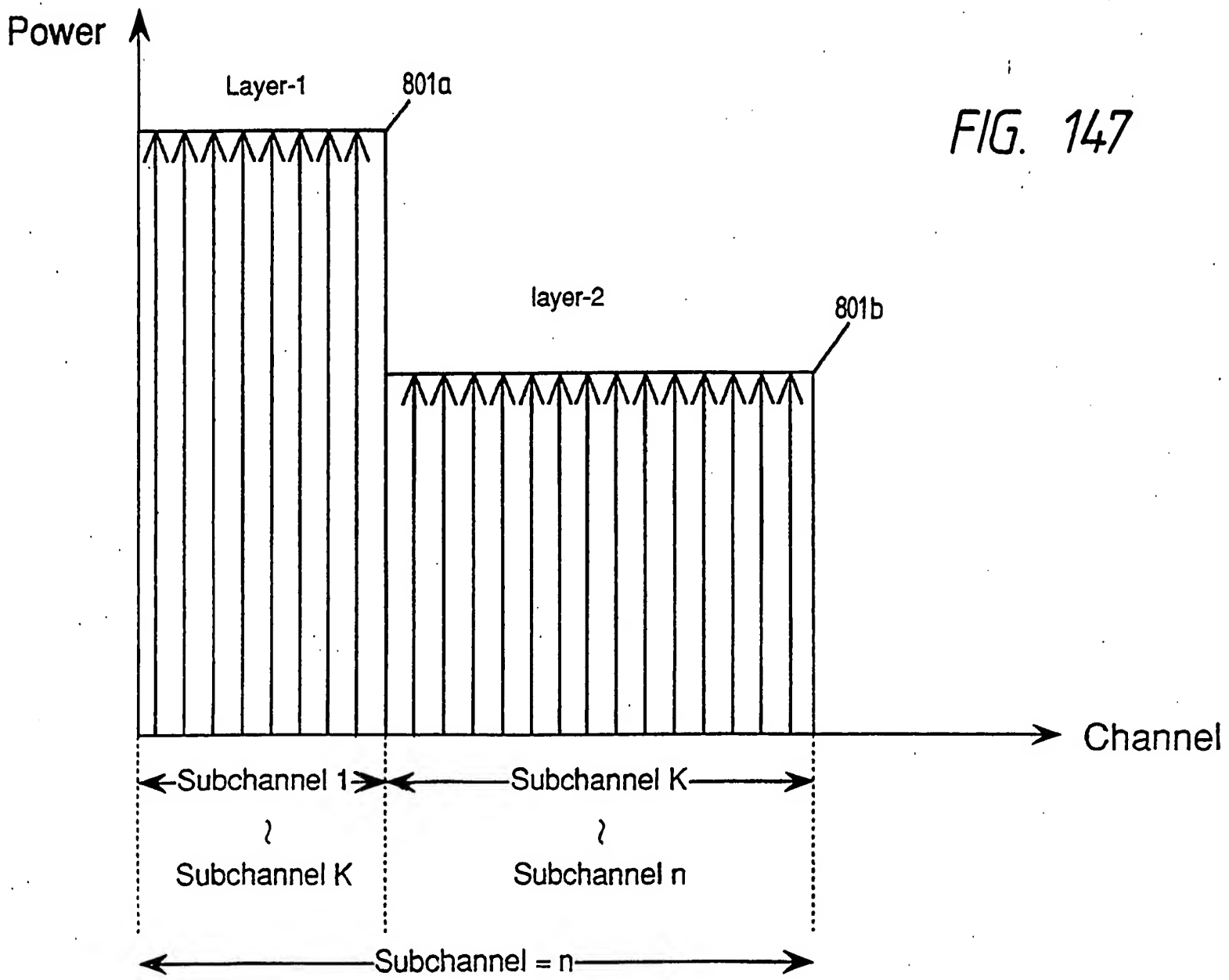

Power
Layer-1
801a
layer-2
801b
Channel
Subchannel 1
Subchannel K
Subchannel K
Subchannel n
Subchannel = n

FIG. 147

FIG. 148

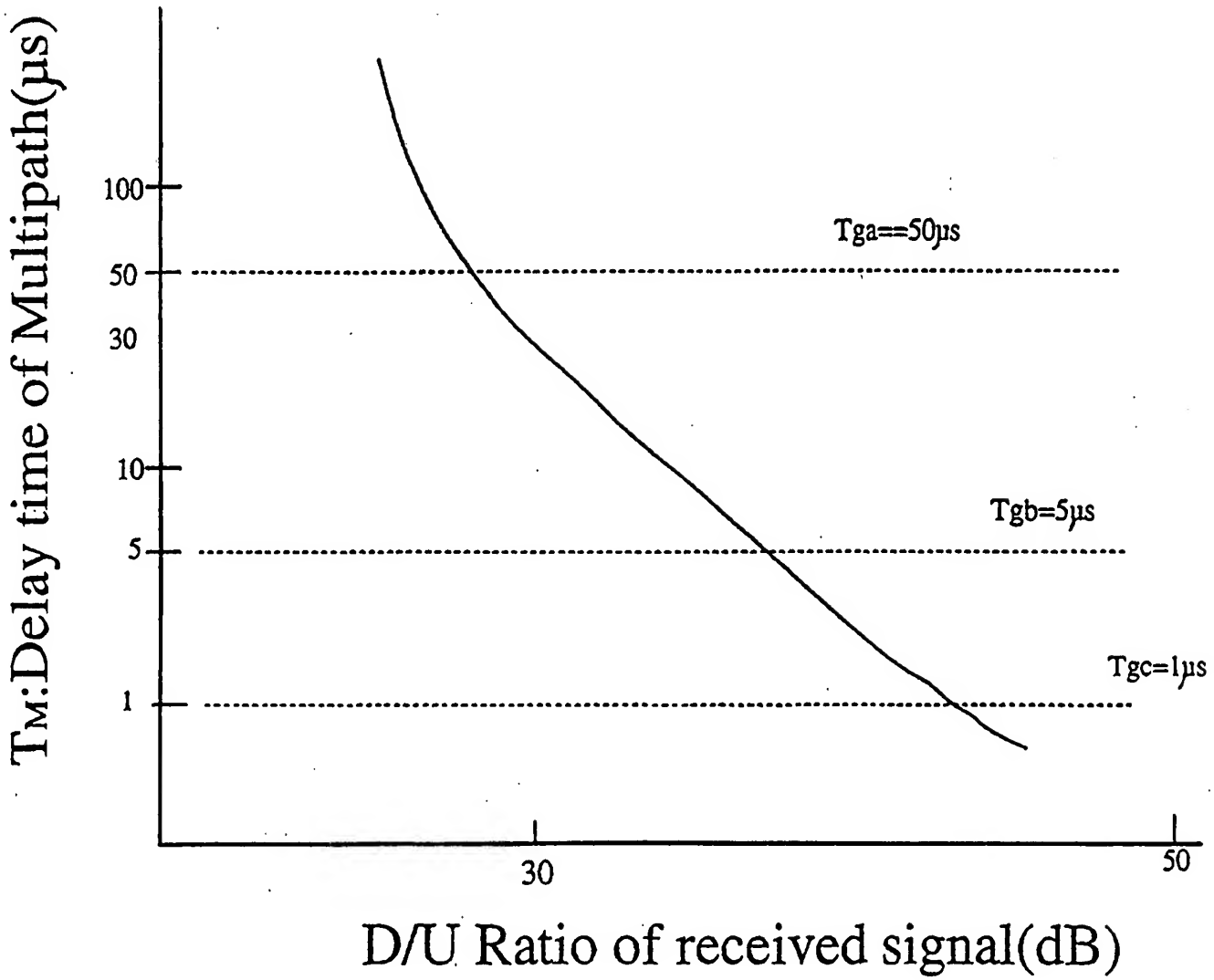

T_M:Delay time of Multipath(μs)
100
50
30
10
5
1
Tga==50μs
Tgb=5μs
Tgc=1μs
30
50
D/U Ratio of received signal(dB)

FIG. 149(A)

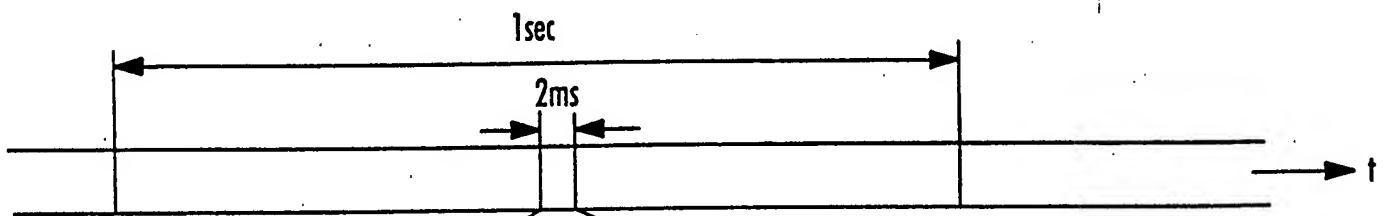


FIG. 149(B)

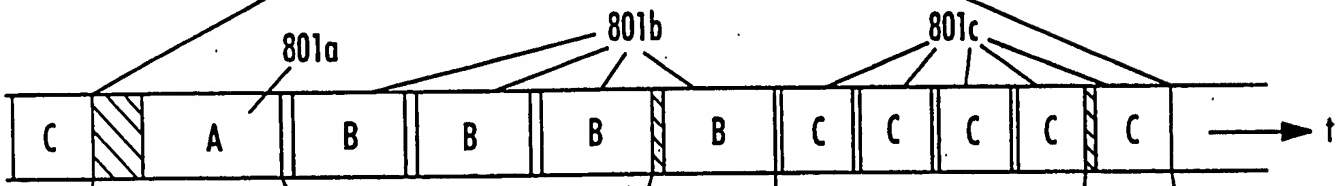


FIG. 149(C)

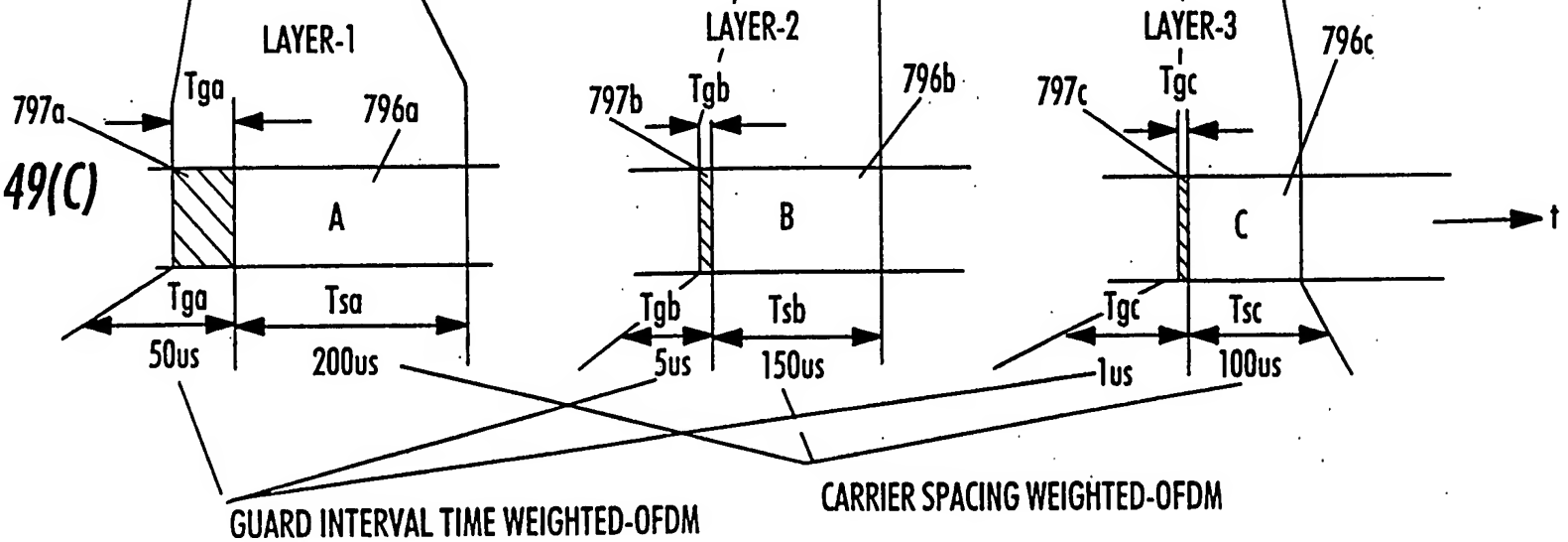


FIG. 150

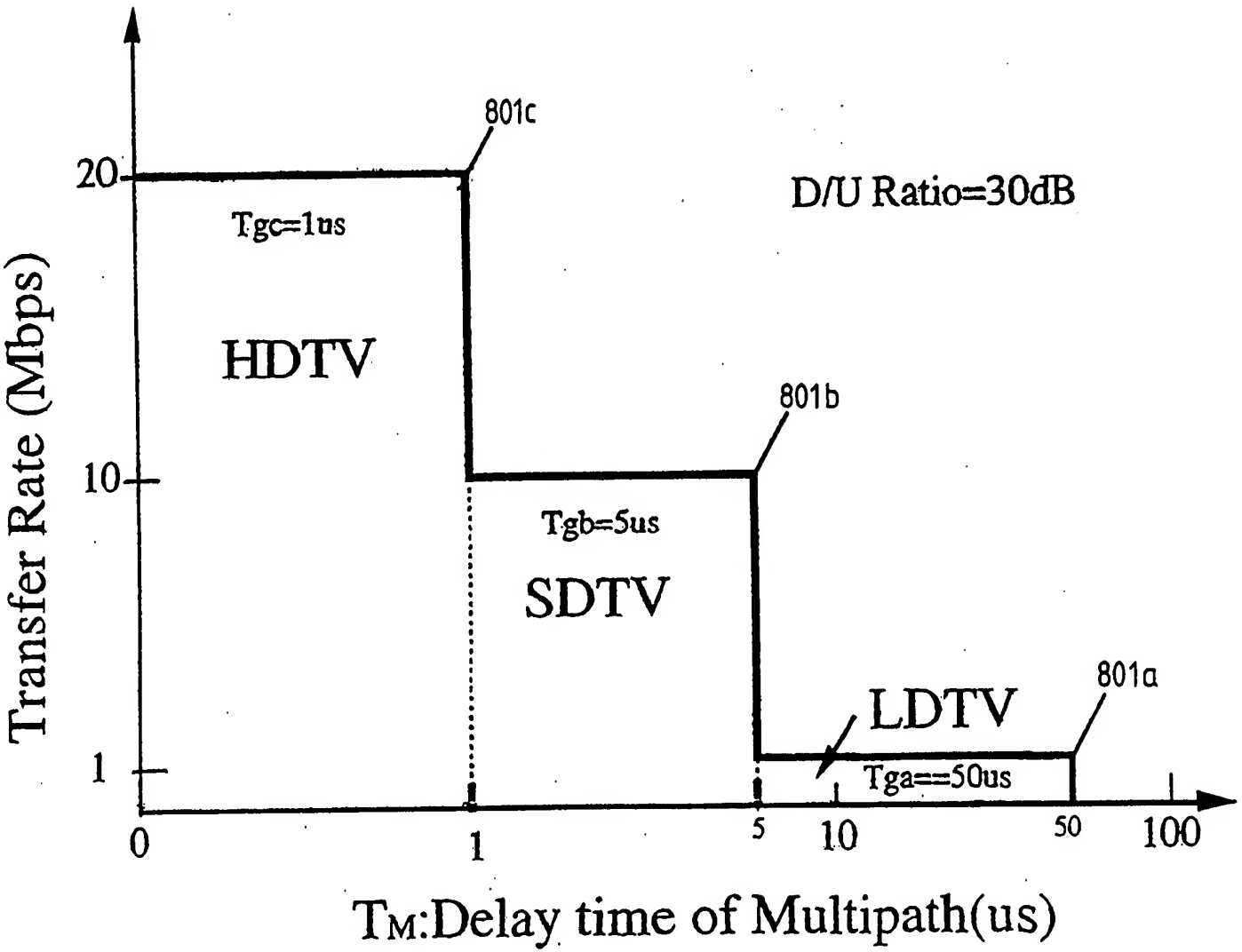
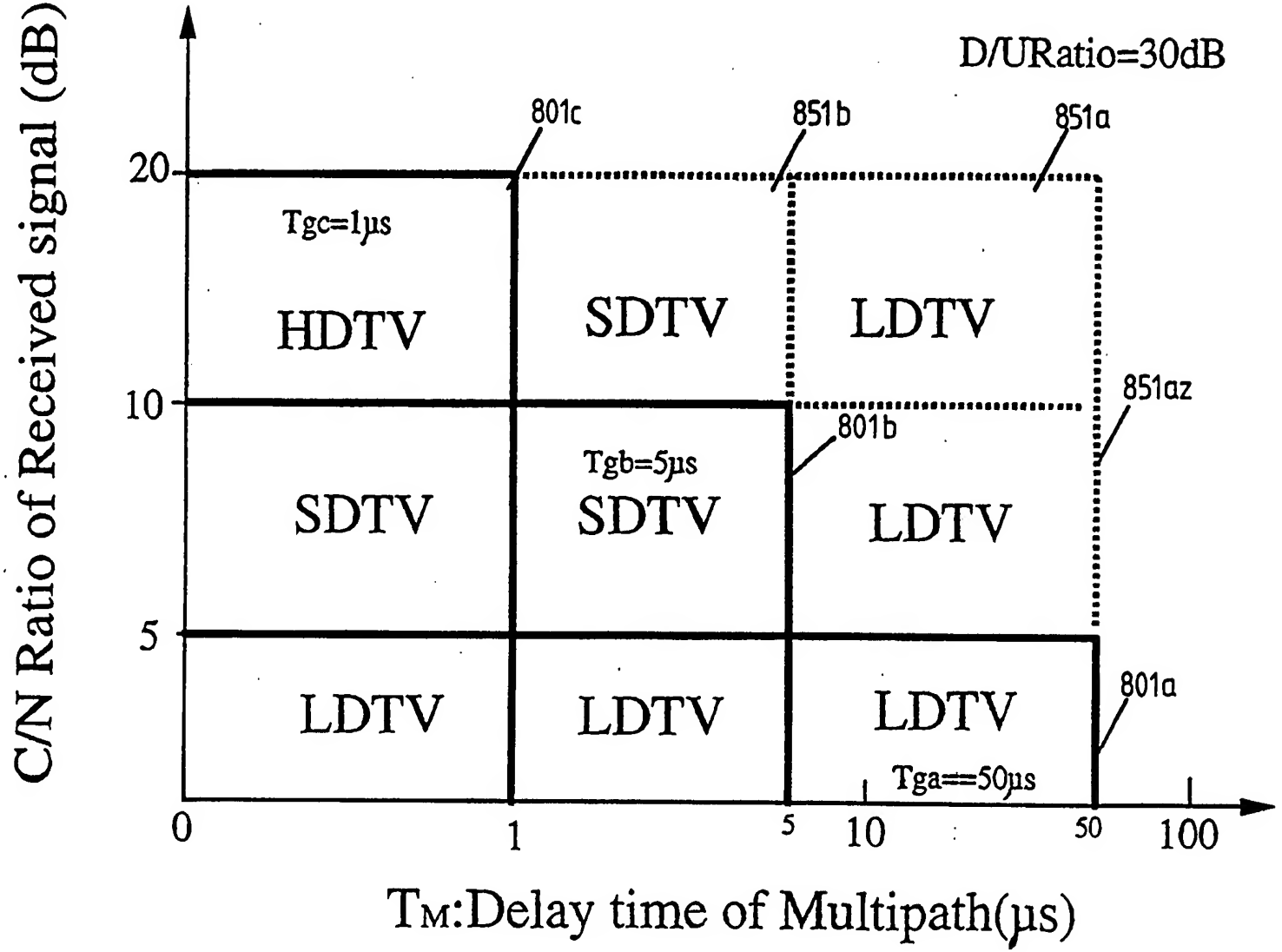

801c
20
D/U Ratio=30dB
Tgc=1us
HDTV
801b
10
Tgb=5us
SDTV
801a
LDTV
1
Tga==50us
0
1
5
10
50
100
Transfer Rate (Mbps)
TM:Delay time of Multipath(us)

FIG. 151


D/URatio=30dB
801c
851b
851a
851az
801b
801a
20
10
5
Tgc=1μs
HDTV
SDTV
LDTV
SDTV
Tgb=5μs
SDTV
LDTV
LDTV
LDTV
LDTV
Tga=50μs
0
1
5
10
50
100
C/N Ratio of Received signal (dB)
TM:Delay time of Multipath(μs)